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VOL. XL.

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NO. 1.

AUTOMOBILE JOURNAL

\$1.50 the year
10 cents the copy

PAWTUCKET R.I.

Aug. 10, 1915

FORD OWNERS

Do you know that—

sooty spark plugs at frequent intervals warn you to investigate your lubricating oil?

If your oil is either too heavy or too light in *body* it will accumulate in the combustion chambers. In burning-up it usually fouls the spark plugs with carbon.

Ford owners who use Gargoyle Mobiloil "E" make the best provision against this common cause of faulty ignition. The correct *body* of Gargoyle Mobiloil "E" prevents its working by the piston rings into the combustion chambers.

Do you know that—

incorrect *body* in your oil also leads to excessive carbon deposit on the piston heads and valve seats?

It is, of course, impossible to produce a petroleum-oil which will leave *no* carbon in burning. But the slight carbon of Gargoyle Mobiloil "E" rarely accumulates. It is of a light, non-adhesive character and expels naturally through the exhaust.

Do you know that—

oil of incorrect *body* fails to maintain a proper oil seal between the piston rings and cylinder walls? Part of the explosion and compression then escapes down past the piston rings. Weakened power results. Gargoyle Mobiloil "E" having the correct *body* for Ford motors, maintains the proper oil seal around the piston rings.

Do you know that

while "light" oils are recommended by your Instruction Book, there is a great difference between oils classed as "light" both in *body* and *quality*.

Many "light-bodied" oils have no real place in any automobile motor. They vaporize rapidly in use. The oil then consumes far too quickly for proper protection to the metal surfaces. Maintenance cost mounts up. The noise of loose, worn parts follow.

In widespread daily use, Gargoyle Mobiloil "E" has shown remarkable ability to readily reach and protect all moving parts of the Ford motor and to maintain a proper oil cushion under the heat of service.

Ford owners who use Gargoyle Mobiloil "E" are providing the best of insurance against costly maintenance and motor repair bills.



Mobiloils

A grade for each type of motor

In buying Gargoyle Mobiloils from your dealer, it is safest to purchase in original packages. Look for the red gargoyle on the container. For information, kindly address any inquiry to our nearest office

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Gargoyle Mobiloil "B"

Gargoyle Mobiloil "E"
Gargoyle Mobiloil "Arctic"

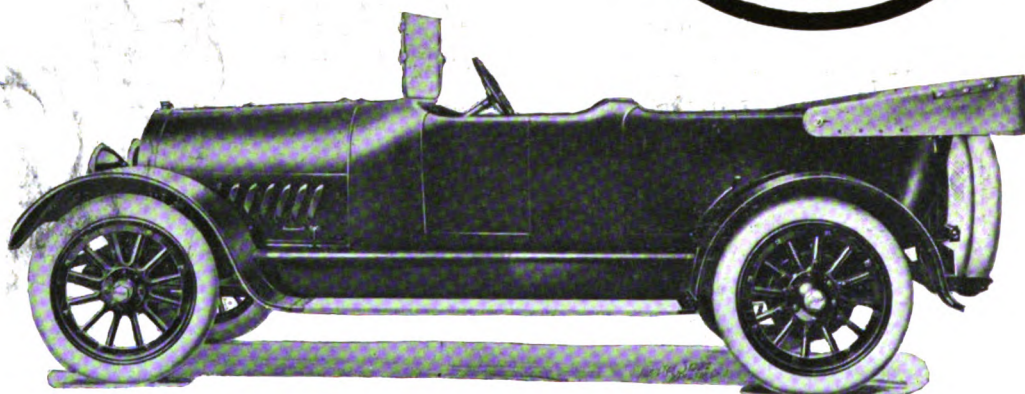
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SIX



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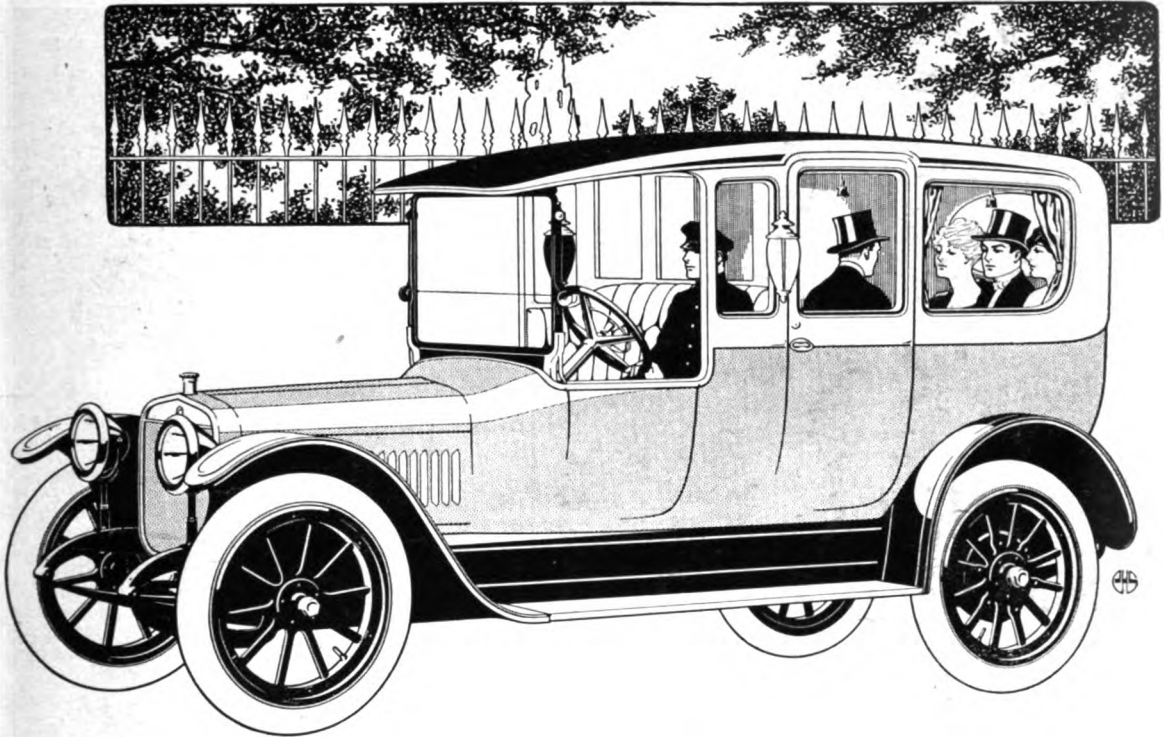
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131 Berea Road, Cleveland, Ohio, U. S. A.

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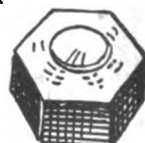
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Polarine

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POLARINE lubricates efficiently under all conditions. It keeps your com-

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HOW MANY CARS CAN YOU NAME?

Each radiator represents a well-known car.

How many can you identify?

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"The Machine with a
Personality"
FEATURE No.2

No Matter
What Your
Personality
May Be—
The ROYAL
MASTER-
MODEL 10
will fit it:



"Just
Turn
the
Knob"

EVERY keen-witted stenographer, every office manager, every expert operator on the firing-line of "BIG BUSINESS" will grasp at once the enormous work-saving value of the *New Royal Model 10*.

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Think of getting through your week's work with the *minimum* of effort and banishing the dull grind of "typewriter nerves."

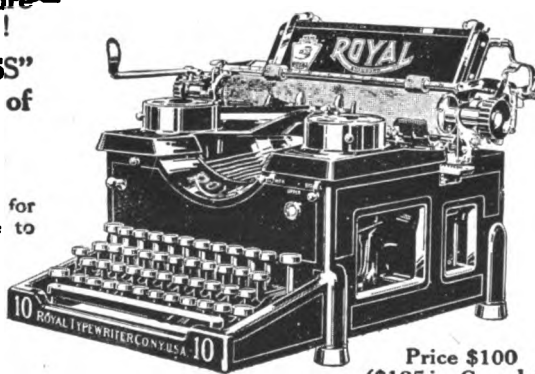
That's only *one* reason why the No. 10 Royal is the *master machine*. There are many other big, vital new features. Combined with the personality of its *regulated* touch, you get a typewriter with 100% speed—100% accuracy—100% visibility—100% durability—making 100% **EFFICIENCY**. A machine with 1,000 working-parts "*minus*"—a typewriter of *long-term service*, that need not be "traded out" and won't "die young."

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BUILT for "BIG BUSINESS"
and its **GREAT ARMY** of
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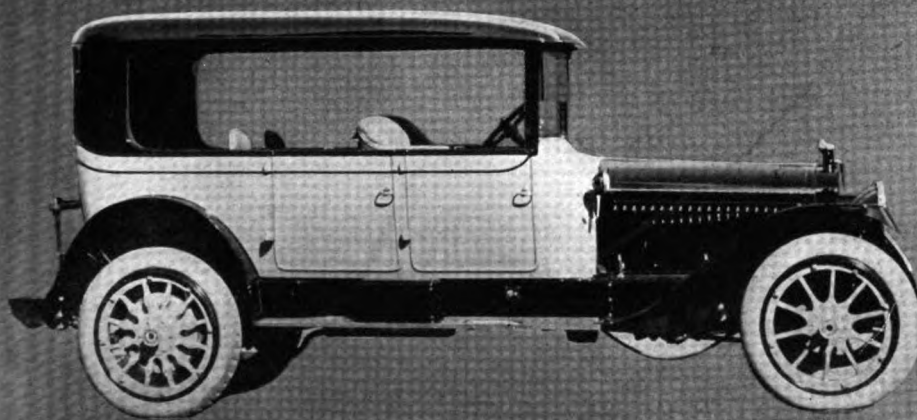
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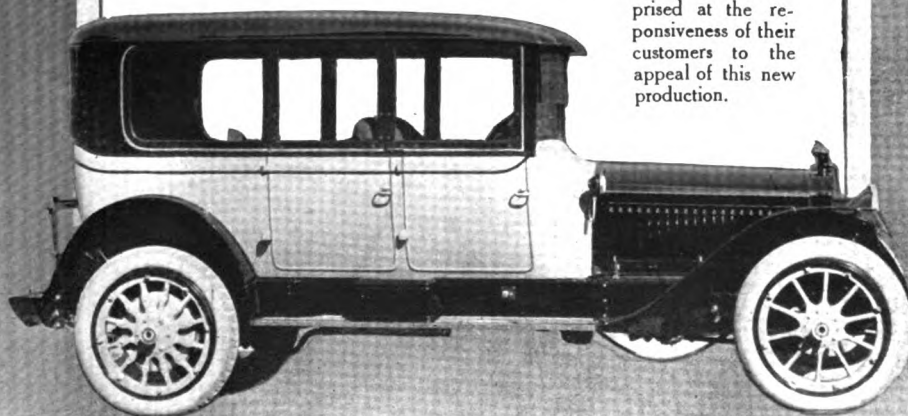
SPRINGFIELD CONVERTIBLE BODIES



THE limousine and the touring car are completely satisfactory only in certain seasons. The new Springfield Demi-Convertible body has no such limitations; it is the all-year, all purpose body.

More and more in America, as in Europe, the tendency is to demand protection from the sun, the dust and sudden showers even in touring. This body with its permanent top provides such protection, while it gives plenty of air and an unobstructed view. It may be converted into a limousine.

Dealers will be surprised at the responsiveness of their customers to the appeal of this new production.



SPRINGFIELD METAL BODY Co.
SPRINGFIELD, MASS.

Index to Advertisers.

	Page
Ahlberg Bearing Co.....	74
Barrett Manufacturing Co....	69
Bosch Magneto Co.....	75
Boyd, F. Shirley.....	70
Coes Wrench Co.....	2
Continental Asbestos Corp....	78
Culver Stearns Mfg. Co.....	70
Dayton Engineering Labora- tories Co.....	Cover
Detroit & Cleveland Nav. Co....	72
Dixon Crucible Co., Jos.....	78
Eagle Oil & Supply Co.....	6
Eisemann Magneto Co.....	73
Garford Mfg. Co.....	76
Goodyear Tire & Rubber Co....	75
Harris Oil Co., A. W.....	74
Hartford Suspension Co.....	78
Heinze Electric Co.....	80
Hotel New Amsterdam.....	73
Hotel Majestic.....	76
Hotel Van Rensselaer.....	70
Indian Refining Co.....	70
Inter-State Motor Co.....	80
Majestic Hotel.....	76
Marburg Bros.....	70
McFarlan Motor Co.....	Cover
McQuay-Norris Mfg. Co.....	77
Mea Magneto Co.....	70
Mecca Mfg. & Spec. Co.....	6
Metz Company.....	73
Milwaukee Auto Specialty Co....	76
New Amsterdam Hotel.....	73
New Departure Mfg. Co.....	80
Nordyke & Marmon.....	80
N. Y. & N. J. Lubricant Co....	78
O-Zel-O Co., The.....	75
Peerless Motor Car Co.....	70
Royal Typewriter Co., Inc....	4
Scripps-Booth Co., The.....	71
Splitdorf Electrical Co.....	72
Springfield Metal Body Co....	5
Standard Oil Co.....	3
Staybestos Mfg. Co., The.....	79
Superior Mfg. Co.....	74
Texas Oil Co.....	76
Thermoid Rubber Co.....	80
Times Square Automobile Co....	6
Vacuum Oil Co.....	Cover
Valvoline Oil Co.....	74
Vanderpool Company, The....	6
Van Rensselaer Hotel.....	70
Weed Chain Tire Grip Co.....	70
Willys Overland Co.....	12
Winton Co.....	1
Wilmo Co.....	70
Zenith Carburetor Co.....	Cover

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with faucets for which no extra charge
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AND SUPPLY CO.**

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Concentration in selling is just as necessary, and is equally as efficient as in production. A selling organization that is not concentrated, cannot afford service, it cannot protect and give individual attention to customers, if the market in which it operates is limited by widely separate representation.

Do you know that The Automobile Journal is the only publication devoted to your industry in which you can concentrate your promotive publicity as you concentrate in your factory organization?

Do you know that The Automobile Journal has for years concentrated its circulation development in the New England States, New York, Pennsylvania, New Jersey, Maryland, Delaware and Eastern Ohio, for the purpose of creating the greatest productiveness for its advertisers in the most productive market for the motor vehicle industry?

Do you know that the owners' circulation of The Automobile Journal is greater than that of any weekly motoring magazine published, and that more than 93% of its subscribers are car owners.

Have you compared the value of the concentrated circulation of The Automobile Journal in these states with the circulation value of similar publications that are distributed throughout the nation, with readers divided between owners and trade interests?

Do you know that when you need real trade service you can obtain 100% trade circulation, not owners, in the Accessory and Garage Journal, a service that is guaranteed to reach every trade interest in America. A concentrated trade service.

Facts that count, at request.



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Accessory and Garage Journal

Automobile Journal

Buyers' Reference and Guide.

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Williams Foundry & Machine Co., Akron, O.

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Gardiner Governor Co., 126 Williamson St., Quincy, Ill.

Lipman Air Appliance Co., 199 Pleasant St., Beloit, Wis. (Portable, Stationary.)

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ANTISEPTIC RESPIRATORS.

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AUTOMOBILE SPECIALTIES.

Motor Specialties Co., Waltham, Mass.

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Russel Motor Axle Co., North Detroit, Mich. (Internal Gear Drive.)

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Springfield Metal Body Co., 20 Medford Ave., Springfield, Mass.

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Scripps-Booth Co., Detroit. (Scripps-Booth.)

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Texas Company, 17 Battery place, New York City. (Texaco.)
Vacuum Oil Co., Rochester, N. Y. (Gar-goyle Mobiloil.)
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Splitdorf Electrical Co., 98 Warren St., Newark, N. J.
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Lane, Will B., 180 No. Dearborn St., Chicago. (Unique Ratchet.)
Moseberg Co., Frank, Attleboro, Mass.
Walden Mfg. Co., 73 Commercial St., Worcester, Mass.

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VOL. XL.

AUGUST, 10, 1915.

NO. 1.

PUBLISHER'S AND READERS' PAGE.

THE Second Installment of the Motor Starting and Car Lighting story starts on page 21 of this issue. It is an analysis of the magnetic and electro magnetic influences incorporated in the systems employed on modern motor vehicles. Every reader should read these articles closely. They not only afford a thorough knowledge of the starting and lighting systems, but an education in the fundamentals of electrical and mechanical developments as applied to motor vehicle practise. Every detail of any consequence that enters into this phase of modern automobile engineering will receive the expert attention of the writer and will be analyzed in language that any and all readers can readily understand without the necessity of referring to a technical dictionary. Copies of the first installment, which appeared in the July 25 issue of The Automobile Journal, can be obtained of the publication office upon request.

Requests for Touring Information relating to trips through northern New England and New York State have been so numerous that the Touring Editor believes a description of a vacational tour through that section would be appropriate at this time. This tour is presented in the current issue of The Automobile Journal. The route leads westward from Boston through Massachusetts and New York State, and in a southerly direction to the Delaware Water Gap. The touring data is accurate and dependable and was gathered from the several exclusive sources at the command of the editor. If any reader desires special information about any particular tour he is interested in, the editor will be pleased to give the information without charge, and if desired will lay out the route, plan the night stops, and indicate the various points of interest, both scenic and historical, to be seen along any given route in any part of the country.

Every Motorist Demands his modicum of convenience in operating, maintaining and repairing his car.

This he can obtain with the regular equipment supplied by the car manufacturer, but to have the greater share of luxurious enjoyment he must repair to the accessory and equipment builder. No better place to view the wares of these manufacturers exists than the editorial and advertising pages of The Automobile Journal. Full information—an editorial analysis of each of the latest and best articles made, the price, and the address of the maker—is given in each number, and care is taken that only the best and most reliable are described. The readers will confer a favor upon the publisher and reap no little benefit themselves thereby if they will mention this magazine when writing to the advertisers and makers of the accessories described.

The New Owners' Department in the next issue will be introduced by a thoroughly practical discussion of a subject vital to every new car owner, which will be continued in its various phases in succeeding installments. The tire trouble story met with wide welcome, and the new owners may look for similar valuable information in following numbers. The correspondence section continues to be one of the big and valuable features of the department. The Mechanical Editor is prepared to answer any question that any subscriber may propound either through the columns of the magazine or by personal letter as the subscriber may desire and specify. Wherever practicable these published answers will be amplified with sketches that thoroughly illustrate the subject.

Ford Car Accessories have never been produced in such a desirable variety and volume as today. The markets are scoured constantly for the best and most worthy of presentation in the Ford department of this magazine, and consequently the readers are kept advised of the latest developments that make for ease of operation, maintenance and repair of the Ford automobile. The manufacturers and dealers mentioned, as well as those listed in the Buyers' Reference and Guide, are reliable.

Partial Table of Contents.

	Page
*The Adirondacks and New York State.....	13
*Tragedy Attends Des Moines Meet.....	19
Why Convicts Like Road Work.....	20
*Motor Starting and Car Lighting.....	21
*Resta Breaks World's Record.....	26
*General News of the Industry.....	27
*Wilmo Combination Manifold.....	31
*Motor Trucks Reduce Subway Cost.....	33
*Trucks Operated Under Contract.....	35
*Practical Motor Car Repairs.....	36
*Car Accessories and Equipment.....	41
*King Adds Roadster to Line.....	45
*San Francisco and Motor Trucks.....	48
*British Women as Truck Drivers.....	49
*Campaign for Uniform Auto Laws.....	51
*Auburn Models 4-38 and Six-40-A.....	53
*Dixie High-Tension 12 Magneto.....	57
*Industrial Happenings and Comment.....	58
*Suggestions for the Ford Car Owners.....	59
*Ford Car Accessories and Equipment.....	63
*Practical Facts for New Car Owners.....	68

*Indicates article is illustrated.

The best estimate of number of owners of motor vehicles in the United States is 2,360,000.

These are served by approximately 40,000 industrial and trade interests—those who buy and sell.

Any publication of national distribution devoted to motoring, to the owner, the industry and the trade, with maximum circulation of from 20,000 to 25,000, can reach but a few of any of these classifications in any given section of the country.

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Other Facts at Request.

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THE AUTOMOBILE JOURNAL

VOL. XL, No. 1

AUGUST 10, 1915

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THE ADIRONDACKS AND NEW YORK STATE.

A 10-Day Tour, Beginning at Boston and Leading Through the Splendors of the Berkshires, the New York Mountains and Lakes.

ONE of the most popular touring grounds for motorists who have from one to two weeks to spend on the road, is the trail through the Berkshires and along the upper Hudson, through the lakes and mountains of northern New York.

The trip outlined here leads over that route and then southwestward across New York State to Delaware Water Gap, Penn. Returning north-eastward, it crosses the Hudson at Kingston and goes back to the New England metropolis through Springfield and Worcester.

The trip leaves Boston via Commonwealth and Massachusetts avenue, running through Arlington to Lexington, where the first skirmish of the revolution was fought. On the Lexington green is a monument to the eight men who were killed in the first skirmish. The monument takes the shape of a minute man standing on a pile of rocks.

In the old burying ground at Lexington is the grave of John Hancock, and the old Hancock-Clark house is still standing. Here Hancock and Adams were sleeping on the night that they

were aroused by Paul Revere.

Eight miles further on is Concord, named so because its first pastor, Peter Odell, bought the tract from the Indians on terms satisfactory to them and settled it peacefully. It is chiefly famous as the home of literary men—Henry D. Thoreau, the somewhat eccentric naturalist; Ralph Waldo Emerson and Nathaniel Hawthorne did much of their best known work there and gathered about them an impressive literary colony, which became world famous.



Bituminous Macadam Roadways Are Common in New York.

Fitchburg, which is now a thriving manufacturing city, is one of recent development, having been incorporated in 1872. It was originally known as Turkey Hills, from the great number of wild turkeys that were found there. Beyond Fitchburg, at Gardner and Baldwinsville, occasional views of Mt. Monadnock are visible in the north. Athol is a sprightly village among the hills, and Orange also is situated in a glen surrounded by hills.

The first night stop is Greenfield, a beautiful town, situated on broad intervals near the



A Fine Stretch of New York State Road.

Greenfield and Connecticut rivers. The Bear's den a ravine with a small cave, is not far from the town. The Poet's seat is on Rocky mountain and provides a fine view of the rivers and of the towns of Greenfield and Deerfield.

From Deerfield to North Adams the road is the famous new construction built with great difficulty by the Massachusetts State Highway commission over the old Mohawk trail. This trail was marked by the Indians in the days of King Philip, and was used by them as a thoroughfare from the Connecticut to the Hudson rivers.

The road follows the bed of the Deerfield river, which in some spots is a narrow gorge, to Shelburne Falls. Here the river in a few hundred yards makes a descent of 150 feet, flowing over two or three distinct falls and a great bed of rocks, roaring through a channel which centuries of action by the water has cut in the rocks.

Two miles beyond Charlemont the road leaves the river bed and begins a winding climb of Florida mountain, sometimes known as Hoosac mountain, through which the famous Hoosac tunnel was cut. The mountain road winds along the side of Cold Brook. It has been carefully laid out, so that nowhere is the grade greater than nine per cent. The country is very wild and wooded. Before this road was built it was practically impenetrable. Whitcomb summit is climbed 29 miles out of Greenfield. There is a flag pole on the peak.

There are few spots in America that provide a finer view than that from the top of the ridge. The entire expanse of the Berkshires spreads out before the travel-

ler with Mt. Greylock in the foreground and the Catskills far away across the Hudson in the background. Immediately below are the red tiled roofs of North Adams. Shortly beyond North Adams is Williamstown, the seat of Williams college.

Beyond South Williamstown the road goes through Hancock and crosses the New York State line in Stephenstown, arrives at Troy and crosses the Hudson into Albany, the night stop.

North from Albany to Saratoga Springs the road goes through Cohoes and Waterford, two manufacturing towns, which are in reality a part of Troy. North of Cohoes the road passes the

Falls of the Mohawk. Beyond Waterford the run is made between the Hudson river and the Champlain canal into Mechanicsville, and thence runs directly into Saratoga Springs.

Saratoga Springs is a very famous watering resort at the gateway to the Adirondack mountains. The springs are said to have been known to the Indians for centuries before the white man occupied the country. They were mentioned by Jacques Cartier in 1535. The water is saline and charged with minerals. In the town there are about 30 springs. There are many fine drives in Saratoga. One of the most popular is to Kaydross park, on Saratoga lake, and another to the top of Mt. McGregor, where General Grant died in 1885.

North of Saratoga the route runs through numerous small towns and crosses the Hudson river into Glen Falls. There is located a fall 50 feet high, which furnishes water power for numerous mills. Through a picturesque ravine the



View of the Berkshires Near Lenox, Mass.

road descends by easy grades to Glen lake.

Lake George is not far beyond. This charming body of water was first discovered by a white man when Father Isaac Jogues, a French priest, was taken to it by the Iroquois, who had captured him and were bent on putting him to death. He escaped and went to France, but returned later and met his death shortly after at the hands of an Indian of the same tribe.

He called the lake "Lac du St. Sacrement," and it is still known as that by the French. Lake George was also called Horicon in the fiction of J. Fenimore Cooper, and that name is sometimes now applied to it. During the French and Indian wars lakes George and Champlain afforded a route for the war parties of both sides who travelled up and down and met in many bloody combats on their shores.

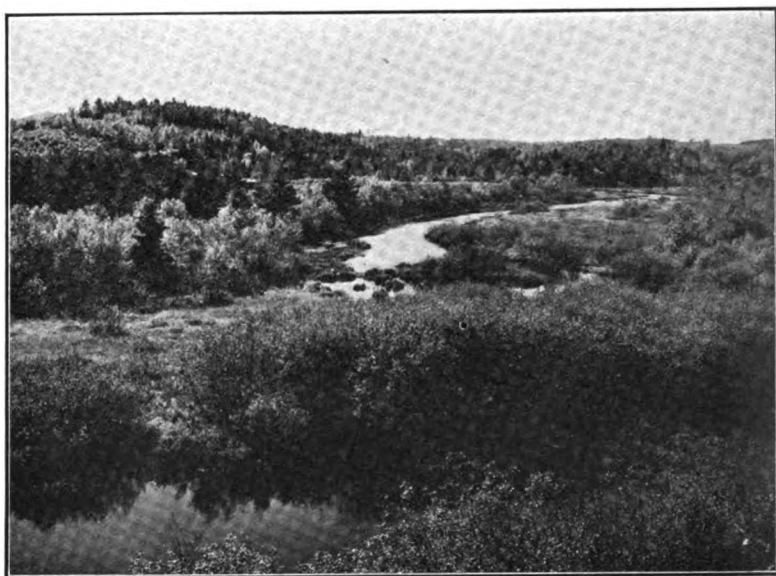
There are numerous forts built near the shores of the lake and many monuments to the men who died there. Bloody pool marks the point where a detachment of French were overcome by the English and their bodies thrown into the water. Fort William Henry was besieged by the French and Indians at one time. Smallpox was raging inside the fortifications and the place was surrendered on the promise that the prisoners would be protected from the Indians. This promise Montcalm would not, or could not, keep and everybody in the English party was massacred, including the women and children.

Leaving Lake George the road runs through a narrow valley and crosses the Schroon river at Warrensburg. From here the road winds over the hills to Chestertown, at the lower edge of Loon lake, a very beautiful sheet of water. Beyond Potterville the road passes along the left shore of Schroon lake, which has an elevation of 807 feet and is one of the most beautiful of the Adirondack lakes. It is 10 miles long and lies among picturesque hills. There is good fishing and hunting in the neighborhood and at Taylor-on-Schroon and Schroon lake village are a number of hotels. From the lake the road follows the Schroon river through a pleasant valley into Elizabethtown, the night stop.

Elizabethtown is the chief centre of the Adirondack region, which extends from the New York State line to the Mohawk river and from Lake Champlain nearly to Lake Ontario. Some of the

peaks are higher than 5000 feet, the highest being Mt. Marcy, which is 5345 feet. There is still much lumbering carried on in the woods that cover the mountain sides. Hunting and fishing are the chief pastimes. There are camps of all types, some of them being exceedingly luxurious. Guides are available for hunting or fishing trips.

The road from Elizabethtown to Malone leads through some of the finest scenery in the Adirondacks. It runs through Keene valley and along the Cascade lakes to Lake Placid, one of the best known of Adirondack resorts. A well known hunting and fishing club occupies Moose Island, in the lake. There is a small steamer on the lake and many launches and small boats are available. The route also touches Saranac lake, an-

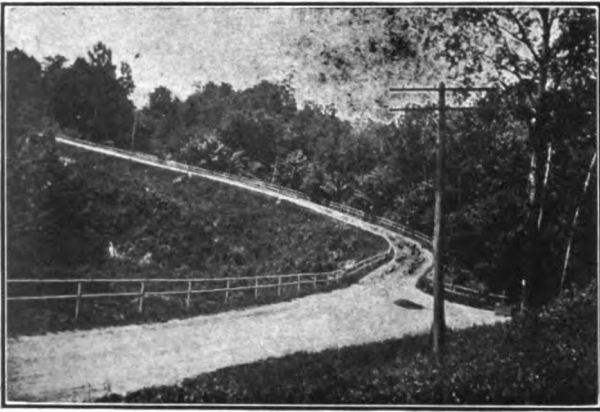


Otter River Winding Through Massachusetts Hills.

other well known resort for sportsmen.

The next day's run goes through the outlying sections of the Adirondacks to Watertown, a manufacturing town of about 30,000 people, which is the chief western gateway to the Adirondacks and a starting point for tours to the Thousand Islands of the St. Lawrence river.

About half way between Watertown and Binghamton is Syracuse, the largest city in central New York State. It is located on Onondaga lake and its principal industry is the manufacture of salt, from the salt springs and marshes about this lake. It has extensive manufacturies. The Erie canal runs through the centre of the city and the traffic on the canal contributed to the early growth of the town. Syracuse university has extensive buildings and a large number of students.



Growth Is Cleared Out to Make Roads Visible on the Turns in New York.

From Syracuse the road goes almost straight south through Cortland to Binghamton, a manufacturing city of about 40,000 population at the junction of the Chenango and Susquehanna rivers. Hill, river and lake scenery, with excellent roads, make for a pleasant trip.

Southward through the hills the route runs through very picturesque and interesting country to Scranton, a centre of the great anthracite mining region of Pennsylvania. Out of Scranton over a fine boulevard the tourist begins shortly to ascend the Alleghenies. He crosses the Pocono mountain plateau and reaches the summit of Mount Pocono, from which point a descent begins to the Delaware Water Gap.

There is a summer village at the gap and many excursion hotels. The place is visited every year by thousands of summer tourists. The gap is caused by the Delaware river breaking through the Kittanny river on a sharp turn. The mountains on either side rise abruptly to a height of 1600 feet. There are hotels on many of the peaks. There is supposed to have been in prehistoric times a lake behind the mountains which broke through and excavated the gap.

Out of Delaware Water Gap toward Kingston the first town of importance is Port Jervis, N. Y. It is located where the Neversink river enters the Delaware. It is at a point where three states join—New York, New Jersey and Pennsylvania. This fact is advertised by the Tri-State rock, which is reached through Laurel Grove cemetery. There are the remains of an old Indian fort in the northern part of the town. There are interesting drives up the Neversink valley, over the Hawk's Nest

road and to Saw Kill Falls. High Point, 1600 feet above the sea level, is a picturesque resort, and Lake Marcia, in the foothills of the Kittanny mountains, is only four miles east of the town.

Between the gap and Port Jervis the tourist passes through a great basin in which the Delaware river lies. This was called Minisink in the Indian tongue, meaning "The Water Is Gone," and is supposed to refer to the ancient lake that broke through the mountains. There are some exceptionally beautiful falls at Bushkill, which is the junction of the Little and Big Bushkill creeks.

Through the splendid, picturesque scenery of the Neversink valley the road leaves Port Jervis and follows an abandoned canal to Cuddebackville, and turns up the valley of Basherkill through the outskirts of Wurtsboro, into Ellenville, at the base of the Shawangunk range. This is not far from lakes Mohonk and Minnewaska, two popular mountain resorts. Lead, copper and zinc mines are operated near the village and there are many points of interest in the surrounding hills.

There is an old Indian fort at Napanoch. Following Sandbury creek the tourist passes through many small villages into Kingston. Out of Kingston the road crosses the Hudson river and continues straight east to Rheinbeck, whence it turns north to Hudson and northeast to Great Barrington, Mass.

From Great Barrington the road goes northward to Lenox, the seat of many fine estates in the Berkshires, and then turns east again to Springfield, one of the most important of New England industrial towns, and the seat of the Springfield arsenal.

Worcester is a manufacturing town in the Blackstone valley and a large railroad centre. It is the seat of many schools and seminaries. Thence the route goes east into Boston.



Brant Lake Vies with the Mountains in Attracting Tourists.

Boston-Greenfield, 97.8 Miles.

	Distance	Out	Return
Boston	0.0	0.0	97.8
Arlington	6.3	6.3	91.5
Lexington	5.1	11.4	86.4
Concord	6.8	18.2	79.6
North Acton	6.6	24.8	73.0
Littleton Com-			
mon	2.9	27.7	70.1
Littleton Centre	0.8	28.5	69.3
Ayer	5.9	34.4	63.4
Lunenburg	8.5	42.9	54.9
Fitchburg	4.0	46.9	50.9
Crockerville	3.3	50.2	47.6
Westminster	4.1	54.3	43.5
South Gardener	3.8	58.1	39.7
Gardener	0.6	58.7	39.1
Otter River	4.6	63.3	34.5
Baldwinsville	1.3	64.6	33.2
Athol Center	8.7	73.3	24.5
Athol	1.1	74.4	23.4
Orange	4.6	79.0	18.8
Millers Falls	10.9	89.9	7.9
Turners Falls	4.7	94.6	3.2
Greenfield	3.2	97.8	0.0

Greenfield-Albany, 89.3 Miles.

	Distance	Out	Return
Greenfield	0.0	0.0	89.3
Shelburne	5.7	5.7	83.6
Shelburne Falls	3.8	9.5	79.8
Charlemont	8.4	17.9	71.4
North Adams	19.0	36.9	52.4
Williamstown	4.9	41.8	47.5
S. Williamstown	4.8	46.6	42.7
Hancock	10.0	56.6	32.7
Stephenstown	3.1	59.7	29.6
Alps	8.4	68.1	21.2
Grasshouse	3.2	71.3	18.0
Sandlake	0.5	71.8	17.5
Averhill Park	1.0	72.8	16.5
Troy	9.9	82.7	6.6
Albany	6.6	89.3	0.0

Albany-Elizabethtown, 136.5 Miles.

	Distance	Out	Return
Albany	0.0	0.0	136.5
Latham's Corners	7.6	7.6	128.9
Cohoes	4.5	12.1	124.4
Waterford	1.9	14.0	122.5
Mechanicville	8.6	22.6	113.9
Maltaville	6.1	28.7	107.8
Saratoga	10.3	39.0	97.5
Glens Falls	19.1	58.1	78.4
Lake George	9.1	67.2	69.3
Warrensburg	6.5	73.7	62.8
Chesterstown	12.7	86.4	50.1
Loon Lake	4.0	90.4	46.1
Pottersville	4.9	95.3	41.2
Schroon Lake	9.5	104.8	31.7
Schroon River	9.1	113.9	22.6
Elizabethtown	22.6	136.5	0.0

Elizabethtown-Malone, N. Y., 86.5 Miles.

	Distance	Out	Return
Elizabethtown	0.0	0.0	86.5
Keene	12.4	12.4	74.1
Lake Placid	15.2	27.6	58.9
Saranac Lake	9.8	37.4	49.1
Duane Center	31.0	68.4	18.1
Whippleville	14.7	83.1	3.4
Malone	3.4	86.5	0.0

Malone-Watertown, N. Y., 111.1 Miles.

	Distance	Out	Return
Malone	0.0	0.0	111.1
Bangor	7.6	7.6	103.5
Nicholville	15.3	22.9	88.2
Hopkinton	2.5	25.4	85.7
Potsdam	14.1	39.5	71.6
Canton	10.9	50.4	60.7
East De Kalb	8.2	58.6	52.5

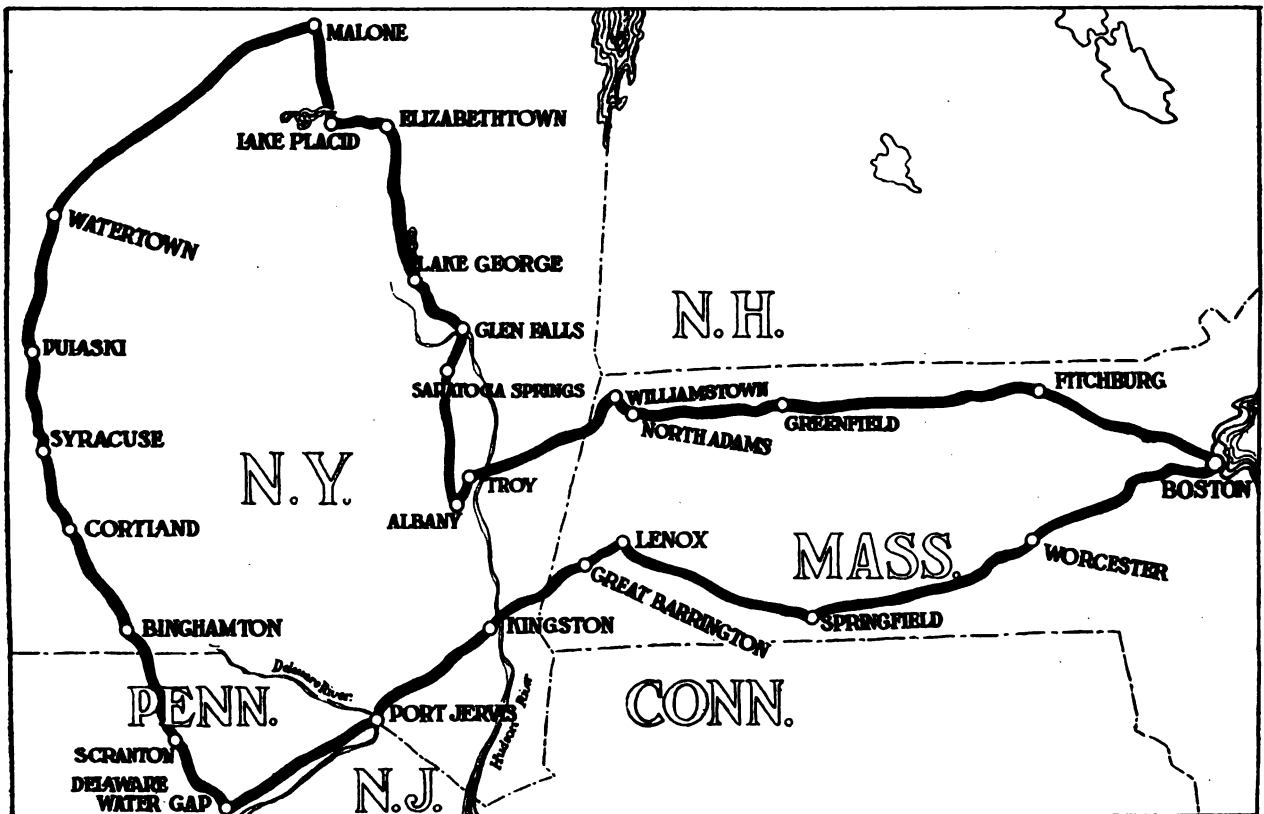
Richville	8.9	67.5	43.6
Gouverneur	6.9	74.4	36.7
Antwerp	12.8	87.2	23.9
Sanfords	19.0	106.2	4.9
Watertown	4.9	111.1	0.0

Watertown-Binghamton, 147.3 Miles.

	Distance	Out	Return
Watertown	0.0	0.0	147.3
Adams Center	10.0	10.0	137.3
Adams	3.7	13.7	133.6
Pierrepont Manor	6.1	19.8	127.5
Mannsville	1.7	21.5	125.8
Lacona	4.7	26.2	121.1
Pulaski	6.7	32.9	114.4
Colosse	10.4	43.3	104.0
Hastings	3.3	46.6	100.7
Central Square	6.0	52.6	94.7
Brewerton	3.4	56.0	91.3
Cleero	4.4	60.4	86.9
Syracuse	9.6	70.0	77.3
Onondage Castle	5.6	75.6	71.7
Cardiff	6.6	82.2	65.1
Tully Center	7.8	90.0	57.3
Homer	12.5	102.5	44.8
Cortland	2.6	105.1	42.2
Blodgett Mills	4.1	109.2	38.1
Messengerville	7.0	116.2	31.1
Marathon	3.5	119.7	27.6
Whitney Point	9.4	129.1	18.2
Castle Creek	8.1	137.2	10.1
Binghamton	10.1	147.3	0.0

Binghamton-Delaware Water Gap, Penn., 131.8 Miles.

	Distance	Out	Return
Binghamton	0.0	0.0	131.8
Great Bend, Penn.	14.6	14.6	117.2
New Milford	6.8	21.4	110.4
Hartford	7.1	28.5	103.3
Glenwood	10.4	38.9	92.9





In the Midst of the Beautiful Lake Country of the Adirondacks.

Fleetville	4.7	43.6	88.2
Wallaville	1.6	45.2	86.6
Waverly	3.9	49.1	82.7
Clarks Summit ..	2.6	51.7	80.1
Providence	4.8	56.5	75.3
Seranton	2.6	59.1	72.7
Moscow Station ..	11.8	70.9	60.9
Tobyhanna	26.0	96.9	34.9
Mt. Pocono	5.0	101.9	29.9
Henryville	6.9	108.8	23.0
Stroudsburg	9.3	118.1	13.7
Delawater Water			
Gap	13.7	131.8	0.0

Delaware Water Gap, Penn.- Kingston, N. Y., 108.4 Miles.

	Distance	Out	Return
Delawater Water			
Gap	0.0	0.0	108.4
Shawnee	3.4	3.4	105.0
Bushkill Station ..	9.0	12.4	96.0
Dingman's Ferry ..	11.8	24.2	84.2
Milford	8.5	32.7	75.7
Port Jervis	7.0	39.7	68.7
Goshen	23.3	63.0	45.4
Montgomery	10.9	73.9	34.5
Walden	4.3	78.2	30.2

St. Andrew	2.7	80.9	27.5
New Platz	12.0	92.9	15.5
Kingston	15.5	108.4	0.0

Kingston-Springfield, Mass., 123.1 Miles.

	Distance	Out	Return
Kingston	0.0	0.0	123.1
Rondout Ferry ..	3.3	3.3	119.8
Rhinecliff	0.1	3.4	119.7
Rhinebeck	2.3	5.7	117.4
Redhook	5.9	11.6	111.5
Blue Storen	9.0	20.6	102.5
Hudson	10.2	30.8	92.3
Claverack	4.5	35.3	87.8
Martindale	6.5	41.8	81.3
Perryville	3.7	45.5	77.6
Hilldale	3.1	48.6	74.5
S. Egremont	6.6	55.2	67.9
Great Barrington	4.1	59.3	63.8
Stockbridge	7.4	66.7	56.4
Lenox	6.0	72.7	50.4
Lee	4.4	77.1	46.0
Chester	17.3	94.4	28.7
Huntingdon	6.9	101.3	21.8
Westfield	11.4	112.7	10.4
Springfield	10.4	123.1	0.0

Springfield-Boston, 93.5 Miles.

	Distance	Out	Return
Springfield	0.0	0.0	93.5
Cherry Valley	4.2	4.2	89.3
Leicester	1.9	6.1	87.4
Spencer	4.9	11.0	82.5
Brookfield	6.8	17.8	75.7
Warren	6.3	24.1	69.4
Palmer	11.4	35.5	58.0
Springfield	15.1	50.6	42.9
Shrewsbury	5.5	56.1	37.4
Northboro	4.5	60.6	32.9
Marlboro	5.7	66.3	27.2
S. Sudbury	7.5	73.8	19.7
Wayland	2.9	76.7	16.8
Weston	3.3	80.0	13.5
Boston	13.5	93.5	0.0

MANY KILLED BY MOTOR CARS.

While the number of persons killed in New York City by the surface cars, elevated and subway during June was the same as last year, namely, 23 people, the number killed by horse drawn vehicles during the first six months of the year was reduced one-half, from 40 to 20, and the number killed by automobiles increased 70 per cent., from 68 to 101 for the six months.

There have been no marked additions to the electric railway transit during the year, so that the number of accidents is in about the same proportion to the amount of service given, with perhaps a little improvement, on the assumption that the growth of the city caused some more people to be carried. The great increase in automobile accidents corresponds closely to the proportionate increase in the number of automobiles as shown by the registrations with the secretary of state. It is highly improbable that horse drawn vehicles have decreased as much as 50 per cent. in number during the year, though they have doubtless decreased to some extent, so the record of that type of traffic is distinctly better.

TRY FARM TRACTORS IN ILLINOIS.

A demonstration of the newer types of farm power tractors, in which 1000 acres of land will be plowed by 30 or more different makes of machines, was held Aug. 3, 4, 5 and 6, at Champaign, Ill., under the direction of the University of Illinois. Many manufacturers showed three or more types of machines adapted to farms of different sizes. Fifty thousand farmers from all over the corn belt, some from as far away as Texas, came to see the demonstration. Some of the companies sent their equipment overland, giving private demonstrations in the districts along the way. One company shipped 36 car loads of tractors to the demonstration with the idea of disposing of them directly to farmers while there. Most of the makers had a considerable amount of stock for immediate sale.

C. O. Reed, W. L. Burlison and I. W. Dickerson of the University of Illinois faculty, gave evening lectures on farm traction, assisted by F. M. White of the University of Wisconsin. Farm experts from all the middle western agricultural schools attended the demonstration.

TRAGEDY ATTENDS DES MOINES MEET.

DES MOINES' new mile speedway was inaugurated Aug. 7 to the accompaniment of tragedy. Joe Cooper was instantly killed;



Mulford, Winner at Des Moines.

Morris S. Keeler, mechanic for Billy Chandler, was mortally injured and died the following Sunday night; Chandler was seriously injured and at the latest reports was said to have less than an even chance for life; Louis Peel, Cooper's mechanic, was badly hurt, but was expected to recover.

Cooper, driving a Sebring, was approaching the grandstand on the 38th lap at the rate of 100 miles an hour when a tire burst and the car skidded to the outer edge of the banked track and toppled over to the ground, 20 feet below. Both driver and mechanic were pinned beneath the wreckage, Cooper's skull being crushed and Peel sustaining a broken right shoulder and hip, a fractured collar bone and concussion of the brain.

Chandler's accident, also ascribed to a tire blow out, occurred in the 238th lap, while his Deussenberg was at its maximum speed. A tire burst and machine and occupants careened and crashed into the inner restraining wall and turned turtle. Chandler suffered a broken hip and internal injuries and was seized with convulsions as he was being taken to the hospital. Morris, the mechanic, was badly injured and died about 36 hours later.

It was a neck and neck race, if such a term can be applied to motor racing. It was so closely contested that when a leader stopped to change tires, or for like reason, he dropped from first to second or third place. That was the experience of De Palma, Mulford and O'Donnell. At the end of the 50th mile O'Donnell, in a Duesenberg, led the field, with De Palma, Stutz, second, and Mulford, Duesenberg, third. Mulford passed the 100 mile mark first, winning \$100, followed by O'Donnell, who was trailed by De Palma. At 200 miles, De Palma was leading and consequently won an extra \$100, Mulford was second and O'Donnell third. At 250 De Palma lost the lead for a few laps, but spurred ahead,

holding the lead to nearly the end of the race.

The last three miles furnished a thrilling spectacle. Mulford and De Palma were racing almost together, and at the finish they were so close that the judges had difficulty in deciding the winner. The first announcement gave Mulford the victory, but this was quickly followed by a change of verdict, giving the honor to De Palma. Even then the judges were uncertain, and, following a long session on Saturday night, it was officially announced that the first decision would stand, that Mulford was the winner. His time was given as 3:27:05.25. It was stated that the decision would be protested with the A. A. A.

The prizes as finally awarded were: Mulford, \$5000 and an extra \$100 for leading at 100 miles; De Palma, \$2000, and \$100 for leading at 200 miles; Eddie O'Donnell, \$1000 for finishing third. The other prize winners were W. W. Brown, fourth position; W. Barndollar, fifth; Pete Henderson, sixth; W. J. Shrunk, seventh.

Coroner Koons decided that an inquest into the deaths at the speedway was unnecessary.

Joe Cooper was one of the younger generation of drivers, and gave promise of becoming a national racing star. He was 24 years of age and had been driving about four

years, his first prominent connection with the sport taking place at Indianapolis last May. At that time there was some opposition to his taking part owing to his age, but he started and ran a very fast race. At the elimination trials at Des Moines, Cooper made 94



Ralph De Palma, Close Second at Des Moines.

Predictions were freely made in the racing fraternity that he had an excellent chance of coming in near the front of the field.

WHY CONVICTS LIKE ROAD WORK.

A CONVICT camp for road work has been established in Missouri and has proved very popular with the prisoners who work very hard for 10 hours a day in order to escape being sent back to their cells. These are some of the features of the road camp, according to Col. Frank Buffum, highway commissioner of Missouri.

The men live in tents, camping out in the open. There is fine fishing in a river nearby, and each man has been supplied with tackle so that he can fish to his heart's content, when he is not on duty. There is a library of the latest books and enough of them for each man. The current magazines and the city newspapers are on hand. The men are furnished with pencil, paper and envelopes. They have a Victrola, a mandolin, indoor games and complete equipment for playing baseball.

Guards are employed at the camp only because the country people objected to having the camp in their locality unless it was guarded. The governor of the state gives three days off a man's sentence for every month he behaves himself in the road camp and does good work. The men work eight hours for the county free and then two more for which they receive the standard rate of wages. The bill of fare includes vegetables, cereals, eggs, fresh meat, milk, butter and sugar—all of good quality and well cooked.

There are 2600 prisoners and only 1000 cells in Missouri prisons, so the road work is looked upon as a very valuable outlet. Most of the prisoners are still worked on the contract system, but this is likely to be abolished very shortly.

HONOR SYSTEM ON MONTANA ROADS.

Over one-third of the prison population of Montana is employed in road building under the honor system, which has been working out very successfully. There are no cells or manacles in the camps and the men are as free from surveillance as they can be. They work cheerfully and well. The only punishment given them is to send them back to the prison if they are not good.

Trusties at the road camps are allowed 10 days extra time in addition to that allowed all prisoners for good conduct. Last year 119 miles of road were built by the convicts, much of which was through a rough country where the work was difficult. Their work is valued by Warden Con-

ley at \$3 per day, the price paid to free labor in Montana. No wage is paid the prisoner and his cost to the state is only 60 cents a day.

Out of the profits derived by the state in this way the warden desires to have a regular wage paid to the prisoner, which could be used in many instances to support a dependent family.

To develop men capable of handling convict labor as the Montana prisoners have been handled, the National Committee on Prisons and Prison Labor has been working in conjunction with the Graduate Highway Department of Columbia university. The committee is now seeking to broaden this co-operation through the establishment of a chair of penology at the university, which would make it possible to train workers for the convict road camps and many other fields of prison work. This, it is hoped, might result in a sentiment that would require expert men for those positions instead of leaving them to haphazard political selection.

EXPERIMENTS WITH SEMAPHORE.

An experiment to improve the system of handling traffic in New York was tried recently when semaphores were installed between Thirty-third and Thirty-seventh streets, on Fifth avenue. A semaphore operated by the traffic policeman on Thirty-fourth street operated simultaneously other semaphores at four other crossings. Traffic was allowed to pass north and south and then east and west for a period estimated to be sufficient for an automobile to travel five blocks before it was interrupted. It is hoped by this plan to make delays to traffic less frequent, although they will be of considerably longer duration.

In a campaign for roads improvement in Oregon the claim is made that if the roads in the state were in good condition this year, especially the Pacific highway, \$1,000,000 would be spent there by tourists, who instead have gone to other states.

Arrests in Massachusetts for violation of the automobile laws totalled 5365 during the past year. Automobilists were the second largest class of offenders, following after drunkards. In all there were 176,618 arrests, the largest number in the history of the state.

MOTOR STARTING AND CAR LIGHTING.

Principles of Electricity Applied to Creation of Power and Light—The Phenomena of Magnetism and Its Relation to Generated Electric Current.

EXPLANATION was made in the previous chapter of the components of the several systems that are used for electrically starting the engine and lighting the automobile. The engine can only be turned by a motor, and this may be a single unit operated separately, or it may be combined with a generator as a motor generator. The generator may be operated independently of the motor. There are three machines that are practical for vehicle service, the motor, the generator and the motor-generator, but to obtain a complete system we must have either the first two mentioned, or the last named.

With either engine starting or vehicle lighting a battery is necessary, and as this is a satisfactory source of current, ignition may be included with either engine starting or lighting. When ignition is required a distributor may be operated independently of either motor or generator, or it may be combined with the generator. This gives what may be classified as four systems—the motor, generator and distributor, each independent; the motor and generator-igniter, the motor-generator and distributor and the motor-generator-igniter. Each system is adopted by the car manufacturer to best meet the requirements of the motorists, and it is designed to afford good service.

Owners Have No Electrical Experience.

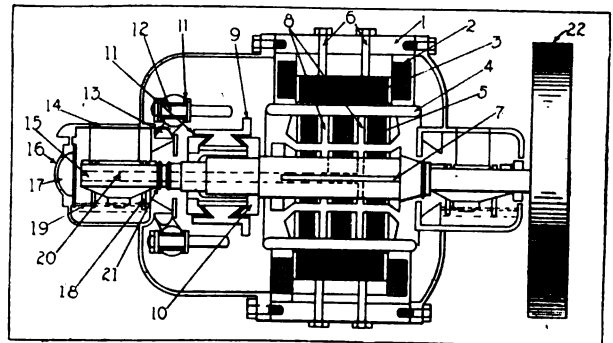
The automobiles are sold because of the greater convenience that obtains with engine starters, electric lighting and high efficiency ignition systems, and the machines, fully equipped, pass into the hands of owners who have generally a mere knowledge that the systems will function, and who do not understand the principles of design, construction or operation. Turning a switch, pressing a pedal or moving a lever to operate a system is known to cause a specific result, but generally through ignorance or neglect, or both, conditions arise that would be anticipated and easily met by an experienced mechanic or electrician.

These systems are highly efficient. They are carefully developed with realization of the fact that they will be in the hands of those who know nothing of electric principles, and are made as nearly fool proof as is possible. There is no rea-

son to believe that the owners will be specially trained or that they will be so interested that they will acquire the fundamentals that are essential for the efficient maintenance of the systems. Every owner of a car equipped with electric starting or lighting apparatus can, by observation and study of certain definite requirements, obtain exceedingly satisfactory service and avoid conditions that are very certain to arise through neglect or what may be regarded as positive abuse.

Built to Certain Principles.

The operation of these systems is governed by certain well established principles or laws of electric design and construction that must obtain, and which cannot be changed. These are absolutely inflexible, and no matter what the desire



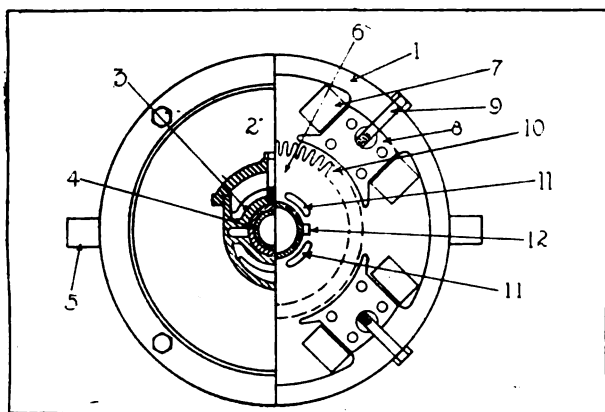
Electric Motor Shown in Longitudinal Section: 1, Magnet Ring; 2, Field Windings; 3, Field Magnets or Pole Pieces; 4, Armature Windings; 5, Armature Core; 6, Field Piece Retaining Bolts; 7, Shaft Keyway; 8, Air Circulation Ducts; 9, Commutator; 10, Commutator Retainer; 11, Insulation; 12, Brush Stud; 13, Brush Rocker; 14, Inspection Plate; 15, Air Circulation Duct; 16, Air Filter; 17, Air Inlet; 18, Oil Rings; 19, Oil Level; 20, Fan; 21, Oil Distributing Rings; 22, Pulley.

or opinion of the owner may be, only certain results can obtain, and specific requirements must be met. The knowledge of the operation of the systems, and the care and attention they should obtain has been acquired by careful experience and experiment, and the instruction given ought to be followed to the letter. In the event of a condition that has not been anticipated, the owner ought to have sufficient regard for his property to obtain the advice of one who has experience and who is competent to make adjustment or restoration.

The purpose of this and the following articles is to present in elemental terms the essential facts that are desirable for the owner or driver to know to utilize the starting and lighting systems efficiently and economically, and to avoid the complication that may develop because of failure to realize the necessities of care and maintenance.

The Phenomena of Magnetism.

A statement of the laws of electricity and their adaptation to the systems is necessary. Electricity and magnetism are associated, and yet each may exist independent of the other. Magnetism is a power manifested by either stone (probably iron ore) or metal to attract other metals. Magnetism cannot exist in all metals, but it is most pronounced in iron and steel, steel being an iron that has been hardened or tempered. Soft iron will become magnetized readily, but it will not retain its magnetism, while steel



Partial Section Four-Pole Electric Motor: 1, Armature Shell; 2, End Plate; 3, Armature Shaft Bearing; 4, Brass Sleeve; 5, Supporting Lug; 6, Armature Core; 7, Field Windings; 8, Field Pieces; 9, Field Piece Retaining Bolt; 10, Channels for Armature Windings; 11, Air Circulation Ducts; 12, Keyway.

will retain magnetism for a much longer period. The magnetism of iron will diminish without continuous contact of other metals, but steel will retain its magnetism for a long period of time unless contacted with other metal that may become magnetized.

The origin of magnetism is unknown. Popular belief associates it with metals and their attraction, but magnetism exists everywhere, and in the form of currents that move in circles across the surface of the earth from south to north. These currents vary in intensity and direction, a condition that has been proven by innumerable observations by and for the information of navigators. And in a like manner whenever a piece of iron or steel is magnetized, or is brought within the range of the magnetic in-

fluence of another piece of magnetized metal, magnetic currents will move through it from south to north.

Paths of Magnetic Current.

The magnetic influences of the earth indicate that these currents pass through the earth from north to south, for at the magnetic north pole of the globe a "dipping needle" will point directly downward, while at the equator it will remain perfectly horizontal, but with all other conductors the path of the current is through them from south to north, and the external current is from north to south. In respect to the paths of the current, those of the earth itself, and of any magnetized object on the earth, differ diametrically.

Just as the earth has north and south poles, any magnet or piece of metal that is within the range of magnetic influence has north and south poles, and no matter how finely divided, even to particles only microscopically visible, these north and south poles exist. Sometimes one or more poles will exist in a rod of iron or steel, besides the end poles, and these may be either north or south, so that there may be several separate fields of magnetic influence in a single bar.

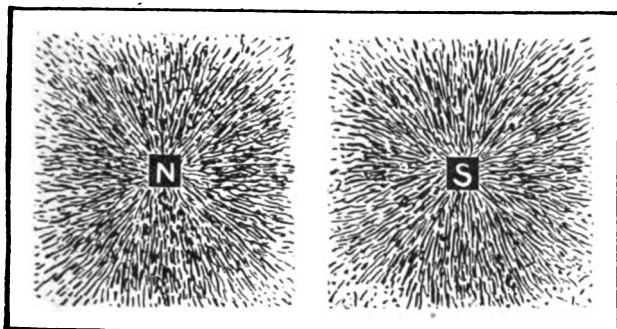
Attraction of the Poles.

One of the characteristics of magnetism is that like poles repel and unlike poles attract each other, so that with the compass the true north pole of the needle points south and the true south pole points north, and when iron filings are subjected to the influence of the north pole of a magnet the south poles of the particles will contact with it, and this arrangement will continue, to the limit of the magnetic field. When a magnetic field exists, its influence extends in a circular area about a centre, a fact that is demonstrated by a familiar experiment with a magnet and iron particles, and this influence is manifested through substances that would be efficient barriers or insulation against electric influence.

The relation of magnetism to electricity is found in the fact that iron or steel can be magnetized by passing an electric current through it. The former metal will become a temporary magnet and the latter a permanent magnet, and while there will be a limit to the magnetic power obtained, by winding either with a coil of wire and passing an electric current through the wire a magnet with attractive force proportionate to the strength of the current can be made. This type is known as an electro-magnet. If the core of the electro-magnet is iron it will retain a slight degree of magnetism, but if of steel the magnetism will be largely permanent.

The current of magnetism passing through a

magnetizable object from south to north and over it from north to south are known as magnetic lines of force, and the position of the needle of a



Experiment with a Magnet and Iron Filings to Indicate the Greatest Strength of Magnetic Influence Is Nearest the Poles.

compass that is free to move according to the influence of the current indicates that these lines of force place themselves parallel to each other. The area in which these lines of force have influence is known as the magnetic field of the magnet. The power of this field is governed by what is known as the law of magnetic attraction, which is identical with that governing light, heat and gravitation, in that it varies inversely with the square of the distance. By this is meant that when the space between two magnetic poles is doubled the intensity of the magnetic field is reduced to one-quarter, when tripled it is reduced to one-ninth, and it decreases in like ratio, this same condition obtaining between magnetic poles of unlike polarity.

The magnetic lines of force enter iron or steel and polarize the molecules and the effect is greatest in wrought iron, somewhat less in mild steel and least in cast iron. The power of magnetic absorption of these metals is known as permeability.

Two Classes of Electricity.

What has been stated refers generally to magnetism as differentiated from electricity, and electricity is in two classifications, that which is at rest and that which is in motion, the former being defined as static electricity and the latter as dynamic electricity. In general any current of electric energy is regarded as dynamic. Nearly all physical and chemical changes generate electricity. Electricity assumes two forms, positive and negative, the former attracting and the latter repelling. Like charges attract each other and unlike charges repel each other. A very general principle is that induction will occur between a charged object and a neutral object through space between them. The value of the induction incurring through air is taken as a standard and

is regarded as one, and the inductive capacity of other bodies is found by comparison with this.

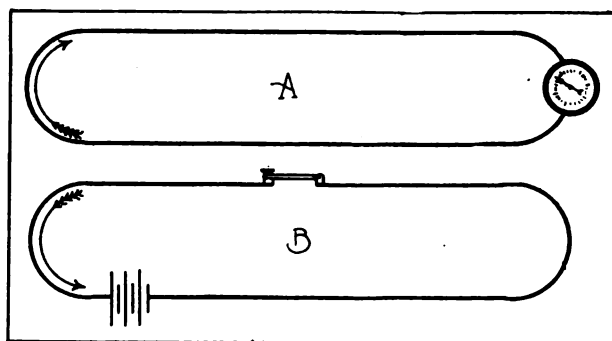
Any moving current or flow of electric influence or energy is created, either by chemical or galvanic action, or by friction or induction. A body that will carry a current of electricity is defined as a conductor, and that which will not conduct electricity is termed an insulator or non-conductor. Silver is one of the best of the metallic conductors, and dry air is one of the best insulators, and included in either classification are many substances, each varying in conductivity or resistivity, among the partial conductors being metals, wood and earth, and among the non-conductors being rubber, porcelain and glass.

Conductors of Electric Current.

A conductor in the general acceptance of the term electrically is what will form a path for a current of electricity. This may be either an entire circuit from the positive pole or terminal of the origin of the current back to the negative pole or terminal, or it may be a path for a portion of the circuit, the remainder being established through the earth or some other form of conductor. A circuit may be made by stretching a length of wire between two points, with the ends of the wire contacting with the ground.

Units of Electrical Measurement.

In considering electricity a knowledge of some of the units of measurement and their application is important. Electromotive force or pressure is measured in volts, the quantity or value of the current in amperes, and the resistance, or resistivity in ohms. Electric current should always be regarded as flowing from a higher to a lower level, or seeking a level, and this flowage represents a pressure that is ex-

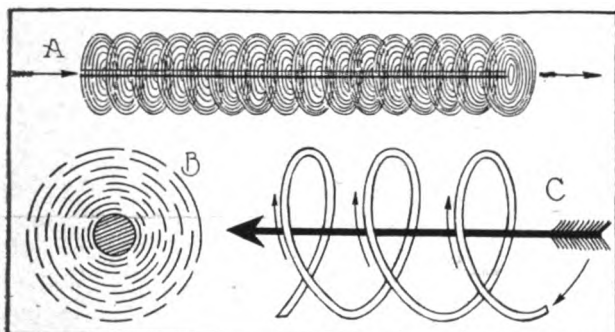


Inducing and Induced Current: A, Circuit Through a Galvanometer, in Which a Current Is Induced by a Current in B, When a Switch Is Closed—Arrows Indicate the Flow of the Induced Current Is in Reverse of the Inducing Current.

pressed in voltage or volts. The quantity of the current is to be paralleled to that of water in that it is limited by the resistance it meets, for just as

the flow of water through a pipe is governed by the size of the outlet and pressure, and not the quantity in the reservoir or the proportions of the pipe, so is the amperage of a current dependent upon the size of the conductor and the voltage.

The fundamental of electrical measurements is Ohm's law, which is in effect that the current is proportional to the electromotive force and inversely proportional to the resistance. When any two of these factors are known the other may be found, so that volts may be obtained by multiplying amperes by ohms, amperes by dividing volts by ohms, and ohms by dividing volts by amperes. Electrical units are known as the C. G. S. units, which represent length in centimeters, weight in grams and time in seconds. They are as exact as engineering science could devise, and with them power efficiency can be very accurately determined from the fact that the



The Movement of Lines of Force: A, the Magnetic Whirl About a Wire Carrying a Magnetic Current; B, the Concentric Motion of the Rings of Influence; C, Arrow Shows the Current Induced in a Coil That is an Electro-Magnet.

working energy available, expressed in amperes, is exactly proportional to the voltage and the resistance of the circuit and to the efficient energy in terms of work accomplished and time required.

The Value of the Units.

The resistance represented by the ohm is equivalent to the resistance to one volt of electromotive force by a column of mercury 106.3 centimeters height and one square millimeter cross section, or the resistance of one foot of No. 40 B. & S. gauge copper wire. The ampere is the strength of current that can deposit .00033 gram of metallic copper, using the electro-plating process, in one second of time, this defining the intensity of the current, which may be taken for its working energy, as well as the time for a given work. The ampere-second is represented by the coulomb, which is technically used to express electrical volume, it being the equivalent to

the product of the amperage of a current by the number of seconds of flow. One volt of electromotive force can produce a current of one ampere on a circuit having a resistance of one ohm. This is an actual standard, and where voltage is stated it may be regarded as a known quantity, for it may be an equivalent estimated on the capacity of a type of galvanic cell. The unit of activity is the watt, which indicates the rate of energy of one ampere of current under a pressure of one volt, and represents the product of the voltage by the amperage. There are other expressions of the value of the watt, which may be the product of the resistance by the square of the current, or the quotient of the square of the resistance by the voltage. Generally the capacity of an electric motor is expressed in watts or kilowatts, and 746 watts is taken as the equivalent of a horsepower. The owner of a car equipped with electrical systems seldom has use for the units of electrical measurement, because the voltage is expressed by the voltmeter, the amperage by the ammeter and the watts by the wattmeter. These instruments are extremely accurate and dependable, and are, of course, designed for the uses made of them.

(To Be Continued.)

AUTO BUSINESS HELPS HAMTRAMCK.

In 1910 the population of Hamtramck, a suburb just outside of Detroit, was 3559, but a recent census taken by representatives of the census bureau at the expense of Hamtramck residents, showed it to contain 21,520 people, a gain of 504 per cent. This is due to erection of many plants connected with the motor industry in that section.

Estimates based on the number of water consumers who patronize the Detroit water board, indicate that the city has gained 58,359 in population during the past year largely as a result of the continued expansion of the motor car business. These figures in the past have always been very accurate as compared to the decennial government census and have erred on the side of conservatism if at all. They place the present population of the city at 678,746 and of the urban district at 760,000.

If anything like this rate of gain continues for the next five years the city is likely to jump from ninth to fourth or fifth place among American cities in size in the 1920 census.

When the automobile business began to develop in Detroit it was a city of less than 300,000 people.

PLANNING A TREE CIRCUIT.

A COMMITTEE of the Massachusetts Forestry Association, which has plans for a 320-mile circuit of the roads in the state that is to be lined with shade trees, has recently made an inspection tour of the roads.

The committee includes Lewis R. Spears, Cambridge, president of the Massachusetts Automobile Association and formerly president of the National Automobile Association; Frederick J. Hillman, Springfield, president of the Western New England Chamber of Commerce; William P. Wharton, Groton, who has done extensive work on a private estate, and Harris A. Reynolds, secretary of the Massachusetts Forestry Association.

Surveys of the route are being made by Prof. H. R. Francis, director of landscape engineering in the New York college of forestry at Syracuse. He is determining how many trees there are at present and how many more are necessary to beautify the highway. It is expected that all figures and plans will be in the hands of the committee by Sept. 15.

The committee expects to be able to buy the trees and shrubs at special rates for the whole circuit, perhaps 50 per cent. less than it would cost the individual cities and towns. The attempt will be made to avoid monotony by dividing the road into units and selecting some special tree suitable to the landscape of each unit.

Working with the committee will be representatives of the state highway commission, tree wardens, city foresters of the various towns along the route and committees chosen from improvement societies and other civic organizations.

FOR NEW HIGHWAYS ORGANIZATION.

Good roads workers and members of many engineering societies have seized the opportunity offered by the holding of the New York state constitutional convention to urge a change in the method of directing and controlling state highway construction.

A committee made up of representatives of all the leading engineering organizations has submitted a joint recommendation to the convention. As highway work is almost entirely an engineering problem, the recommendation is felt to be one of importance.

The first suggestion is that the elective office

of state engineer shall be abolished. The second is for the formation of a department of engineering and public works to be headed by three commissioners appointed by the governor, each of whom is to hold office for 12 years, and the terms to be so arranged that one will expire every four years, allowing each incoming governor to appoint one member. The committee also suggests that at least one member shall be a professional engineer.

This commission should have charge of highways, canals, state buildings and all other engineering departments of the state's activity. The work should be divided into different departments and a permanent chief engineer, selected for his fitness, placed in charge of each department.

CONVICTS TO BUILD MOUNTAIN ROADS.

By the use of convict labor on roads, Charles F. Stern, highway commissioner of California, expects to open for settlement 7,500,000 acres of arable land on the eastern plateau of the Sierra mountains.

Previously California prisoners have not been employed on the roads except for small stretches about the prisons. An act has just been passed by the California legislature enabling their extended use. It is based on the Colorado legislation under which excellent results have been obtained. The road work will be done under the direction of the highway department, but the discipline and care of the prisoners will be in the hands of the prison department.

The men are worked under the honor system and the prison department is authorized to grant an additional good time allowance to the men engaged in road building conditioned upon their loyal and obedient performance of the work.

A census of traffic was taken on the Middlesex turnpike, near Middletown, Conn., on a recent Sunday, with the following result: The figures showing the number and character of the vehicles that passed between 7 a. m. and 7 p. m.: Automobiles, 132; motorcycles, 86; motorcycles with side cars, 27; horse drawn vehicles, 17; bicycles, 21; number of people in autos, 4579; number of people on motorcycles, 167; number of people in horse vehicles, 28; number of dogs in autos, 13; pedestrians, 82.

RESTA BREAKS WORLD'S RECORD.

ESTABLISHING a world's competitive record for 100 miles and defeating three leading American motor racing drivers on one of the fastest speedways in the world are the latest honors achieved by Dario Resta at Chicago, Aug. 7. He made the circuit in his famous Peugeot in 58 minutes and 54 seconds, or at the rate of 102.85 miles an hour.

It was one of the most spectacular contests ever witnessed in motor's realm. Try as hard as he could, Resta was unable to shake off the doggedly following Earl Cooper in his Stutz. In fact, in the second, fourth, ninth, 15th, 20th, 37th, 38th and 39th laps Cooper led the flying British-Italian. From the 40th lap on Resta held the lead, but had to extend himself to his maximum to maintain it. Cooper piloted his Stutz across the finishing line 45 seconds behind Resta.

There were four entrants in the race. Bob Burman in a Peugeot finished third, his time being 1:01:22. Barney

Oldfield, driving a Delage, was flagged at 96 miles. He did not figure as a real contestant, for his machine had developed carburetor trouble before the race and he had been unable to make suitable repairs.

RACING NEWS FROM SHEEPSHEAD BAY.

Among the motorists who have tried out the board surface of the nearly completed Sheepshead Bay track is Dario Resta. Even he was forbidden to speed up his car, a rule which the track management has established and will maintain until the track is thrown open on Sept. 18 to the entrants for practise for the opening 350-mile race on Oct. 2.

"I am convinced," said Resta, "that the Sheepshead Bay speedway is far and away the fastest motor race track in the world, and I am very familiar with the Brooklands and Chicago courses. In fact, I do not believe that any racing cars in existence today are capable of approaching its full speed possibilities."

When practise begins it will be advertised by a great motor parade through Manhattan and Brooklyn. The speedway management has offered prizes for the most beautiful, humorous and grotesque decorations. Paraders will be admitted free to view the first practise, while the general public will be charged a small fee for that day, as well as succeeding days.

The officials report several reservations for box seats and parking spaces. A ticket office is now doing business at 1696 Broadway. Club runs are being organized in New England and other parts of the East, while several middle western clubs have announced their intention to organize runs to the speedway.

NARRAGANSETT PARK RACE MEET.

The new one-mile asphalt track, which has just been completed at Narragansett park, Providence, R. I., will be opened Sept. 18 with a 100-mile race for cars of 450 cubic inches piston displacement, and a 25-mile free-for-all. There also will be a one-hour open race for professional motorcycle riders.

Entry blanks have been issued and entries are being rapidly received. In the 100-mile event there will be seven prizes: First, \$4000; second, \$2000; third, \$1000; fourth, \$700; fifth, \$600; sixth, \$400; seventh, \$300. The race is limited to 14 starters and a speed of 75 miles an hour is required in the elimination trials.

The 25-mile free-for-all will be for four prizes: First, \$400; second, \$300; third, \$200, and fourth, \$100. Fourteen cars will start in this race, contenders being the fastest 14 cars in the elimination trials. The six prizes for the one-hour motorcycle race will be divided as follows: First, \$500; second, \$250; third, \$100; fourth, \$75; fifth, \$50; sixth, \$25.

The meet has been sanctioned by the contest board of the A. A. A. and will be run under the rules of that organization.



Resta, Speed King of 1915 Season.

GENERAL NEWS OF THE INDUSTRY.

Willys-Overland Preparing for Big Business—Goodrich Earns \$4,000,000 in Six Months—Delco Establishes New Records—Several Company Changes.

TWENTY-THREE acres of floor space, which is more than the size of the average American automobile plant, are being added to the already huge Willys-Overland Company at Toledo. In addition to this space, a new office building, 63 by 373 feet, is in process of erection.

One new factory structure alone, which will be five stories high and 400 by 400 feet, is said to be three times larger than the original Pope plant, the nucleus of the present great industrial plant. This new structure will be used for final testing, body assembling and finishing, and will contain 800,000 square feet.

An extension to the enamelling department will provide 3500 square feet more of floor space. The pattern shop is to be enlarged by a three-story, fire-proof addition, 83 by 100 feet, and will give 25,000 square feet of floor space additional. The dry kiln building will be increased in floor space by 31,000 square feet, by the addition of a two-story fireproof extension.

The original Pope buildings are to be rebuilt and enlarged by 53,000 square feet and will be fireproof throughout. A new administration building of steel and tile throughout and seven stories high will replace the old wooden buildings and will contain 165,000 square feet.

Although the production of the company is larger than ever before, and is steadily increasing, the managers find it impossible to gain on the orders pouring in from all parts of the country.

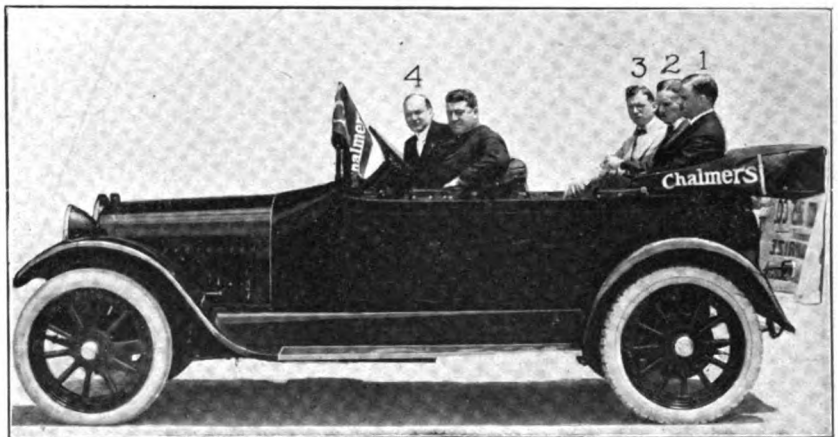
GOODRICH PROFITS FOUR MILLION.

Net profits of the B. F. Goodrich company for the first six months of the year are placed at \$4,000,000 in the company's report, an amount \$1,348,922 greater than those for the first half of 1914. Preferred stock to the amount of \$2,000,-

000 has been redeemed by the company. There is still \$28,000,000 outstanding. The officers of the company have urged that no dividends be paid at this time. The surplus being built up is expected to be used for the further retirement of preferred stock and the reduction of the large capitalization which was created when the Goodrich and Diamond companies were combined.

SAME CHALMERS ORGANIZATION.

Although changes in the Chalmers Motor Company had been rumored, none were made at the annual meeting of the board of directors. The officers elected are Hugh Chalmers, president;



Chalmers Officers and Department Heads—(2) Lee E. Orwell, First Vice President; (3) Paul Smith, Sales Manager; (4) C. A. Pfeffer, Vice President and Assistant General Manager. Percy Owen, Formerly General Sales Manager and Now Vice President of Saxon Company, Shown at (1).

Lee E. Orwell, general manager; C. C. Hinkley, chief engineer; C. A. Pfeffer, secretary and assistant general manager; S. H. Humphrey, vice president and works manager; C. A. Woodruff, purchasing agent.

NO 30% STUDEBAKER DIVIDEND.

A. R. Erskine, president of the Studebaker Corporation, has announced that the company will not declare dividends of 30 per cent. this year, as had been rumored. Earnings for the first six months of the year amounted to about 20

per cent. on the capitalization, but as the war orders received by the vehicle department have all been filled, that section is expected to run at below normal output for the rest of the year. Dividends on the common stock will not be raised above the usual five per cent.

WILLYS SECURES HENDEE MANAGER.

John N. Willys is continuing to strengthen his business organization, the latest and one of the most important additions to the Overland executive staff being Clarence A. Earl, who recently handed in his resignation of the office of vice president and general manager of the Hendee Manufacturing Company, Springfield, Mass. He is expected to join the Willys-Overland company in October.



Clarence A. Earl, Hendee Manager,
Who Will Soon Join Willys-Overland.

Mr. Earl became associated with the Hendee company a year ago, leaving the general management of the Corbin Screw Corporation, New Britain, Conn., which company he had been with for 21 years. The present efficiency of the Hendee plant is generally conceded to be

due to Mr. Earl's exceptional abilities. A large share of the manufacturing responsibility descended from President Hendee's shoulders to his, soon after his joining the company.

In the Willys-Overland organization Mr. Earl will act in an executive capacity.

PRIZE WINNING SALESMAN PROMOTED.

L. K. Cooper, for the past season on special duty in Chicago for the Maxwell Motor Company, Inc., Detroit, Mich., and recently the recipient of a \$500 prize in a nation-wide sales competition, assumes the duties of supervisor of sales in zone four, formerly performed by W. D.

Paine, who recently resigned to join the Detroit Commercial Car Company as president and sales manager.

Both men were with the Maxwell organization at its inception. Mr. Cooper's headquarters will be at Detroit, and his territory stretches from the Great Lakes to the Gulf of Mexico.

KING CHANGES SALES MANAGERS.

Walter L. Daly has ended a successful career with the King Motor Car Company, Detroit, Mich., as sales manager, by resigning his office to enter a venture of his own.

F. A. Vollbrecht, vice president and general manager of the company, announces the promotion of Robert P. Bishop, formerly assistant sales manager, to the vacant post. I. B. Meers, who recently returned to the King company, takes up his old position, the one vacated by Mr. Bishop's advancement.

NEW DETROITER ORGANIZATION.

A. O. Dunk, president of the company which is to continue the production of Detroit cars, is said to have drawn to the concern strong financial support. The executive staff of the company, headed by Mr. Dunk as president and general manager, includes R. B. Merrill, assistant general manager and factory superintendent; Wallace C. Hood, general sales manager; Frank M. Eldredge, advertising manager; Robert T. Yeats, director of exports; W. S. Yale and T. J. Houlihan, purchasing agents. Engineers are working on a new 1916 design.

CHANGES IN TIMKEN-DETROIT.

At a recent meeting of the board of directors of the Timken-Detroit Axle Company, W. R. Timken was re-elected president; H. H. Timken, formerly vice president, became chairman of the board; A. R. Demory, formerly second vice president, became vice president; Eugene W. Lewis, formerly secretary and treasurer, became vice president; Herbert W. Alden, while retaining the duties of chief engineer, became vice president; Frederick C. Gilbert, formerly assistant secretary, became secretary; C. W. Dickerson, formerly assistant treasurer, became treasurer; W. H. H. Hutton, Jr., formerly purchasing agent, became director of purchases.

Following the retirement of E. B. Lausier, who had represented the Timken-Detroit com-

pany and the Timken Roller Bearing Company of Canton in the eastern territory, George L. Biting has been made the representative of both companies in the territory from Cleveland eastward. P. W. Hood continues to represent both companies in Detroit, Chicago and the West, and the Timken-Detroit Axle Company only in southern Michigan. Harry J. Porter, Detroit, formerly representing both companies, will represent only the bearing company in his old territory, with Ohio, Indiana and points south added. C. E. Gordon, Indianapolis, will represent only the axle company in the territory from Toledo south and between Pittsburg and St. Louis.

McDUFFIE WINS QUICK PROMOTION.

Joseph H. McDuffie, veteran in the automobile industry, distinguished as the manager of the first retail automobiles salesroom in America, recently chosen to take charge of the newly formed Willys-Knight division of the Willys Overland Company, has been promoted to assistant sales manager of the entire organization.

As the present production of the company is soon to be 600 cars a day, and their dealer organization has reached the 4000 mark, the appointment will be welcome to Sales Manager Harry B. Harper in the executive work incident to the marketing of those cars.

COLE DECLARES CASH DIVIDENDS.

At the annual stockholders' meeting of the Cole Motor Car Company, Indianapolis, held during the last of July, the usual cash dividend was declared and a satisfactory amount carried into the surplus account.

The company's annual statement shows that the last year has been one of the best in its history and that the season now being entered will show an increase of business that will be recorded in the millions of dollars.

During the last three months of the fiscal year just closed approximately 100 car loads of Coles a week were shipped to all parts of the country and to most of the foreign countries.

At the present time the Cole dealer list is larger by far than ever before, due largely to the popular demand for Cole "8" models.

DELCO BREAKS RECORDS.

All previous production records in the Dayton Engineering Laboratories Company went by the board in the third week of July. Tuesday, 645

motor generators were made; Wednesday, 521; Thursday, 703; Friday, 690 machines were passed through the final inspection department. On this last named day 1555 complete systems left the shipping department, the largest number ever shipped from the factory in one day. In the shipment were 928 systems for one motor car company.

RICHMAN IS COLE FACTORY MANAGER.

J. F. Richman, formerly production manager for the Cole Motor Car Company, has been promoted to factory manager of the Standardized plant. He has been with the company for about three years, one of his first services being the general supervision of the Cole company's present model plant.



J. F. Richman, Factory Manager of Cole Company.

Before joining Cole he was with the Hudson Motor Car Company and previous to that with the Oscar Lear Company, Springfield, O., now the Kelly Springfield Motor Truck Company. He served many years with the Oldsmobile company.

PAIGE PAYS ANOTHER DIVIDEND.

After having distributed a 100 per cent. stock dividend to its stockholders, the Paige-Detroit Motor Car Company has ordered the disbursement of a five per cent. monthly dividend on both old and new stock, or 10 per cent. on the old stock. It is payable Sept. 10 to stockholders of record Aug. 31. The capitalization of the company was recently raised to \$1,000,000, and in addition to the stock dividend among the stockholders \$250,000 worth has been ordered transferred from surplus to capital.

NEW PAIGE PRODUCTION MANAGER.

W. A. Wheeler has been appointed production manager of the Paige-Detroit Motor Car Company by President H. M. Jewett. James F. Bourquin, who formerly had charge of this work, is no longer connected with the company. Mr. Wheeler will assume the full responsibility for the production of 20,000 Paige Sixes scheduled for this year.

OWEN NOW SAXON VICE PRESIDENT.

Percy Owen, sales manager of the Chalmers Motor Car Company when Harry Ford, president of the Saxon Motor Car Company was assistant general manager there, has resigned the position of general sales manager of the Chalmers company, which was recently created for him, and has joined Ford in the Saxon company, becoming vice president, with entire charge of sales.

ESTABLISHES FOREIGN DEPARTMENTS.

On account of the increasing volume of inquiries from foreign sources asking for sales territories, the Olds Motor Works is preparing to enlarge the company's activities throughout the world. This is in spite of the fact that the company is pushed to meet its domestic orders. Production is now being speeded up and facilities improved.

VELIE TO SELL THROUGH DEALERS.

Velie motor cars which have in the past been largely distributed by dealers in the farm implements made by the John Deere Plow Company, are in the future to be sold by regular automobile dealers and distributors. The John Deere interests own much stock in the Velie company and their connection with the manufacture of the car is to be continued.

ELECTRIC CABRIOLET FOR \$1250.

The Menominee Electric Manufacturing Company has completed the first of the electric cabriolets which it is to manufacture to be sold at \$1250. The car has a wheelbase of 108 inches and is fitted with Exide batteries and Goodyear Cord tires. It can be charged for from 50 to 60 miles and is capable of a speed of from 18 to 20 miles an hour. The car weighs approximately

1800 pounds. A charging outfit is furnished, with which the car can be charged directly from an electric light socket. The company expects to sell 150 cars the first year.

SECOND-HAND TIRES.

Seconds of the Dreadnaught Tire and Rubber Company, bearing the words, "Vacuum Tread," cannot be sold unless the words "made by the Dreadnaught Tire and Rubber Company," are used on the treads or the words, "Vacuum Tread" are removed. This was the decision of Judge Edward G. Bradford in the United States district court for Delaware in a suit brought by the Pennsylvania Rubber Company, which held that Dreadnaught seconds were being passed off as productions from its factory.

ARTHUR PARDINGTON IS DEAD.

Arthur R. Pardington, vice president and secretary of the Lincoln Highway Association, died of cancer of the stomach at the age of 53 years. The demise occurred July 28 at the Haroer hospital, Detroit, the city to which Mr. Pardington went to take over the work of promoting the Lincoln highway, his life's ideal. He is survived by his widow, his mother and three daughters.

\$100 FOR THE BEST NAME.

The newly organized International Rubber Company, Denver, Col., is offering \$100 to the car owner (to which class the contest is restricted), who suggests the best name for the company's new tire protector and its new brand of rubber tires. Any number of names can be submitted, which will be passed upon by five disinterested judges.

G. H. Dalrymple, who has been connected with the automobile industry for the past nine years and was formerly with the Speedwell Company of Dayton, O., has joined the sales staff of the Standard Motor Truck Company of Detroit, Mich., and will travel in the states of Indiana and Ohio.

The Pierce-Arrow Motor Car Company, Buffalo, N. Y., is working to capacity with 5000 men employed. Much of the business is war orders and nearly all of it is on trucks. Many of these, however, are made for American firms.

WILMO COMBINATION MANIFOLD.

AUTOMOBILE engineers have sought for many years, with more or less success, to overcome the necessity of consuming a much larger amount of gasoline when starting a cold motor as when operating it under normal load conditions. At present the difference in the amount required is estimated by competent engineers to be about 67 per cent. This means that not only an excess amount of fuel is consumed, but that the heavier particles of gasoline to condense on the walls of the intake manifold. When the motor is warmed up these heavy particles are vaporized and ejected into the cylinders, where they cause a too rich mixture and result in excessive carbonization.

The condensation of the heavier particles can be understood when it is stated that the gas velocity in the average motor will range from 1100 to 20,000 feet per minute, travelling from the carburetor to the cylinder in from 1/50 to 1/270 part of a second. Consequently, a considerable amount of heat is required to raise the normal temperature of the gasoline to that necessary for complete vaporization, as it passes through the short length of the intake manifold.

It is practically the consensus of opinion among engineers that the variation in temperature between summer and winter has a negligible effect upon the motor. The temperature of the intake gas is governed by the exhaust gas, and it is upon this principle that the Wilmo Company, 1260 Continental and Commercial Bank building, Chicago, has built its combination exhaust and intake manifold. The Wilmo manifold is cast integral, with a thin dividing wall between the intake and the exhaust. The heat of the exhaust is expected to maintain the proper temperature in the walls of the intake, and to insure that the gasoline will be fully vaporized before entering the cylinders.

Preignition is prevented in the intake part of the manifold by the great velocity of the gas passing through it. Cold air is drawn through the carburetor, allowing an extremely fine adjustment, and then gradually raising the temperature until it reaches the cylinders.

The Wilmo manifold has been thoroughly tested, and after a year's use it was found that there were no hard flint carbon deposits on the pistons or around the valves. Cars that formerly had to have the carbon removed every 60 or 90 days ran through an entire season without

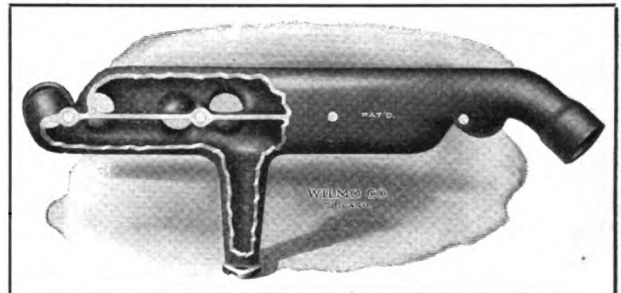
carbon trouble when equipped with the manifold.

The manufacturer claims that the manifold will increase the power of a motor from 10 to 40 per cent., and reduce the fuel consumption. It is not designed to facilitate the starting of the motor, but to take care of the excess gasoline that ordinarily would be wasted by improper vaporization.

The manifold is designed to fit all motors of the L head and valve in the head type, where port openings are all on the same side.

OTHER BUSINESSES OPPOSE MOTORS.

Since the automobile became cheap enough to be purchased by great numbers of people, and has absorbed millions of dollars that formerly



Cut Away View of the Wilmo Combination Manifold.

went to other businesses, there are indications that bankers, grocers, butchers and many others intend to exert all the influence they can to arrest the spread of motor cars.

Bankers throughout the farming districts have lately been very unenthusiastic about loaning money to automobile dealers who operate in the rural communities. At a recent bankers' convention in Wisconsin bitterness was expressed toward the automobile industry, chiefly because it had taken millions of dollars worth of deposits out of the banks by the farmers, who purchased cars with it.

A demand at the same time was made upon automobile manufacturers that they sell their machines on time, as agricultural implement concerns do, instead of exacting cash. The present system, the bankers complained, takes vast amounts of money out of their communities and the cash basis of course gives rise to no paper which the banks can handle.

That the grocers are in about the same state

of mind is indicated by an article in the Interstate Grocer, a trade paper printed in St. Louis. An editorial states:

"Look around among your customers and note the number of machine owners who have or are now trading with you and who owe balances that are growing or who have discontinued trading and left a rather substantial debt. Have they not become slow pay since coming into possession of those expensive eating luxuries? And are you not possibly to blame by having had your judgment carried away simply because they own one of these pleasure cars?"

"And while we are on this subject of automobiles, is it not logical that they are partly responsible for the present depressed conditions? Have you noticed that auto owners do not buy as liberally or as good quality as before enjoying that privilege? Have they not bought less clothes, shoes and other necessities? Has not too much money been diverted to this one industry for the benefit of the country as a whole?"

The theatrical business is one that always blamed its depressions on the automobile, also, until the moving pictures came along to take the greater part of the censure.

WON'T REGULATE THE JITNEYS.

The Indiana Public Service Commission has refused to assume jurisdiction over the jitneys and undertake their regulation at the request of officials of Indiana traction companies. A bill giving the commission specific powers to regulate the 'buses was defeated at the last session of the legislature.

In Kansas City the Green 'Bus line, operating with 16 jitney 'buses, ceased operations because its cars were taken out of its hand by foreclosure. The cars were purchased by men who had practically no capital, and payments were not met.

When the Green 'buses went out of business the White Star line, a co-operative enterprise, fearing the same fate, immediately announced that it would charge 10 cents fare. But the competition of small touring cars forced a return to the old rate in two days.

There are now as many jitneys operating in Kansas City as there were early in the spring.

INFORMATION BOOTH IN SALT LAKE.

Permission has been granted by the city of Salt Lake to Charles Tyng, counsel of the Lincoln Highway Association for Utah, to erect near

the city hall and county building a booth where information will be given to travellers over the Lincoln highway.

Thousands of tourists are expected in Salt Lake this season over that route. Telephone connection with the booth will be used for collecting information daily from the various towns in Utah regarding road and weather conditions, which will be passed on to all tourists who call at the booth.

The station will be equipped with complete log books of the highway and of all Utah roads, as well as with information regarding hotels, garages and other matters of like nature. Salt Lake is the first city to establish a Lincoln highway information headquarters.

NEW AUTOMOBILE INSURANCE POLICY.

A new combination auto policy, which may cover all risks to which the auto owner is subjected, or any combination of risks, is now being offered by the New England Equitable Insurance Company, acting with the Insurance Company of the State of Pennsylvania. Under this unique contract the automobile owner can secure any form of automobile insurance, including public liability, property damage, collision, theft and fire, or any combination of these forms that he may desire.

The insurance companies are mutually interested in rendering exceptionally good service to the assured, his broker and their own agents, and have arranged to give especially expeditious handling to any claims brought under the new contract.

GAS TUBING MADE FROM GLUE.

Successful efforts have been made in Germany to manufacture a substitute for rubber tubing out of solidified glue. These tubes, for which the trade name "Sonjatin" has been adopted, are even better than rubber for some purposes, since they are more impervious to gasses and more resistant to heat. It is claimed that they do not grow rotten so quickly as rubber and that when encased in a suitable envelope will withstand high pressures. They are very cheap, costing only about 4½ cents per foot. The inventor, Prof. J. Traube, declares that they are well suited to conduct petroleum and gasoline, as well as gas. They are attacked, however, by water and that limits their usefulness.

MOTOR TRUCKS REDUCE SUBWAY COST.

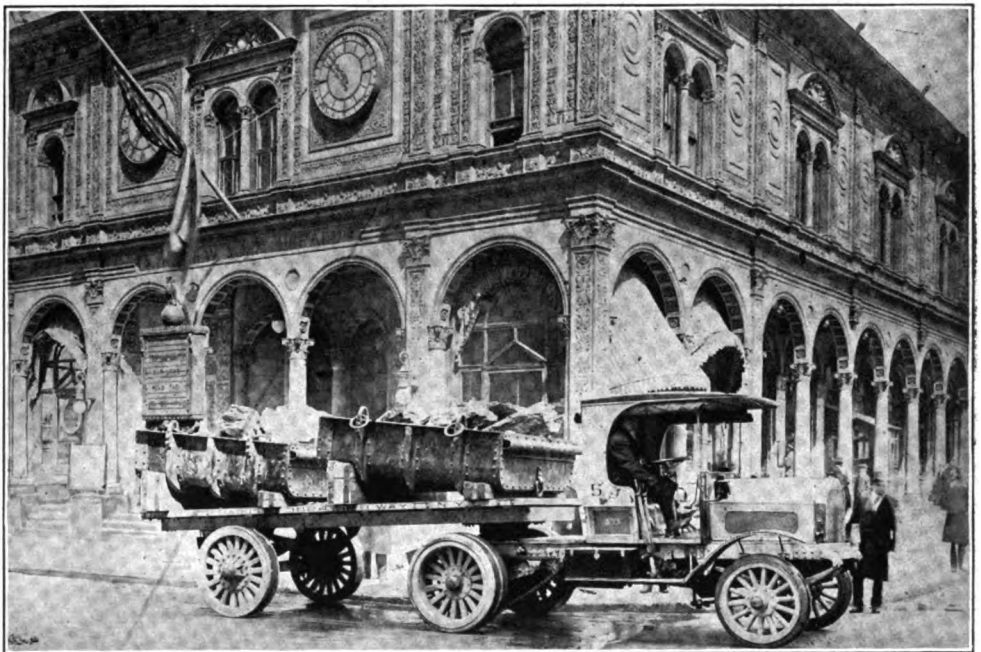
TAXPAYERS of New York City would have to pay a considerably larger sum and wait longer to enjoy the benefits of the dual subway running under Broadway and Sixth avenue were it not for the motor trucks that are taking such a large part in its construction. This is an incontrovertible verity, as is the fact that their employment in the work admits of the continuation of traffic over the thoroughfares while the excavation and construction work is going on underneath.

The different phases of the work are romances of industry, equal to the building of the Panama Canal, and they would fill a volume in the narration. This article will be confined to the part the motor trucks play in the "big ditch's" excavation, mainly in hauling away the material dug out from the section around Herald square, at the junction of Broadway and Sixth avenue.

The United States Realty Company was the contractor assigned to that section—the work on the whole system was so stupendous that it was divided among several contractors. The realty company had no hauling facilities, and contracted with Jacob Fradus for that work. Fradus had only horse drawn vehicles, which could not be utilized in this particular work owing to the fact that he would have needed 50 two-horse teams and that number would cause constant interruption to the other traffic passing that busy point. Motor trucks were his only solution. He first secured four 7½-ton Mack trucks from the International Motor Company, and later added eight more to the equipment.

Both contractors set up the most modern appurtenances possible. In the excavating work

small industrial railroads were built, which carried huge steel "skips" filled with excavated material from all parts of the digging to the opening beneath the tower erected at a central point in front of the Herald building. These skips weigh 3300 pounds each, and each has capacity of about 3½ cubic yards. When loaded with soft material, such as dirt, they are hauled to the gravity bin above the truck by means of a hoist operated by electricity from a travelling cab on overhead tracks above the bin, and dumped into the waiting truck without the necessity of trimming the load. But when loaded with heavy



This Mack Chassis and Trailer Hauls More Than Twice the Load for Two Two-Horse Carts, Makes Twice as Many Trips and Is Worked Twice as Long.

fragments of the rock ledge predominating in that part of the subway, they are raised in the skips, which are deposited upon the chassis, as shown in the illustration, and then carted to the dumping grounds.

Fradus was required to haul and dump at the minimum rate of 1000 cubic yards a day, but under his contract he also was required to dispose of all material above that amount that was dug during the day and night. And above all he was required to keep his trucks moving so that there would occur no block in the usual traffic passing through the streets, and to take the material as fast as it was ready, so as not to interfere with the

excavation operations. Motor trucks enabled him to meet all these requirements, and to meet them economically.

The economy effected by motor trucks has been estimated as follows: Horse drawn vehicles on one route from subway to dump made on the average of eight trips a day, and averaging about three cubic yards of material to the load. Motor trucks averaged about 16 trips and each carried $6\frac{1}{2}$ to seven cubic yards.

The comparison of the work by money values must be only approximate. Two-horse teams, cart and driver, can be hired for \$6.50 a day. Two such teams could haul about 15 loads on short runs if no time was lost in delays and they were

by the Studebaker Corporation. The experiment will be tried first in Detroit.

The plan is to have two service cars running up and down the streets of Detroit equipped with tools and prepared at any moment to render service to any automobile owner who may be in difficulties. Aid will be proffered any owner in changing tires, putting up his top, tinkering with his motor and so on. At night the cars will haunt the down town parking places and help any attendants at the theatres.

STUDEBAKER'S AERIAL CONVEYOR.

To economize in time and labor, and consequently manufacturing costs, the Studebaker Corporation has established an aerial conveyor in its No. 3 plant at Detroit. Its purpose is to provide a means of transferring automobiles bodies and wheels to the assembling department in another building, quickly and without the necessity of sending them to the ground floor by elevator and then raising them in the other building by elevator to the assembling rooms.

The cable reaches a distance of 780 feet from the third floor of the one building to the fourth floor of the other. The tow cable is operated by a 10-horse-power electric motor, and the mechanism is entirely automatic. Only two men are required for all transportation

operations. It is understood that the Studebaker Corporation has other improvements under way.

NEW TYPES OF CASE TRACTORS.

Several new types of gas power machinery were shown to J. I. Case Plow Company branch managers during a recent convention held in Racine, Wis. A demonstration was given of the Wallis Tractor Cub, as one of the new models is called, and of the J. I. Case Power Life Gang Plow.

During the first 24 hours of Pittsburg's enforcement of auto laws, 810 persons were haled into court. The majority of arrests were for speeding, too bright headlights and open muffler cut-outs.



Aerial Conveyor in Studebaker Plant for Transportation of Bodies from One Building to Another.

worked 16 hours a day. This would mean about \$13 daily for team haulage.

The trucks can haul twice the tonnage and make twice the number of trips in the same working period, and thus they accomplish work that would cost by animal power approximately \$52 a unit. The operating cost is about \$20 a day for motor trucks, and they work steadily and nearly always carry capacity loads. The machines were worked through the winter storms and they are not impeded by the severest of hot weather, as are horses.

STUDEBAKER'S NOVEL FREE SERVICE.

A novel type of free service directed rather at securing the good will of all automobile users than at satisfying its own customers, is planned

TRUCKS OPERATED UNDER CONTRACT.

NEW YORK CITY commercial houses now have the opportunity of having their motor trucks efficiently and economically operated at a cost considerably less than they could maintain the service themselves. Incidentally, they can be relieved of all responsibility of operation and maintenance, and, greatest of all, perhaps, can know definitely at any time exactly what this transportation system will cost.

This service is what the Federal Operating Corporation is offering in association with the Federal Motor Truck Company of New York.

The company does not supply the trucks, but does supply operators, garages and constant maintenance for a fixed sum. The commercial house contracts with the Federal corporation for a year's service in connection with the one or more Federal trucks the customer supplies. The contract price varies, according to conditions, the weekly sum per vehicle being from \$42 upward. This means a minimum of \$7 a day, or about \$2100 a year. Operation costs end there, ex-

cept for the time the truck is operated beyond the period stated in the contract. The only other expense to the truck owner is registration, taxes, interest on investment and depreciation.

The service the Federal corporation gives includes competent drivers, who receive orders direct from the customer; garages and keeps the trucks to a standard of appearance; supplies gasoline, oil and grease; repairs and renews tires; repairs, inspects and adjusts the truck, and should the truck become inoperative through accident, supplies a substitute machine until the original vehicle is ready for service.

The contract price is based on mileage. If the maximum amount is not supplied there is no

reduction; but if it is exceeded then it is charged for above the contract sum. The odometer shows the excess number of miles run.

The trucks are sent to the places of business at a specified hour and are ready for instant service. In the event of accident or failure the operator does not bother the customer, but communicates directly with the operating company. At the end of the day's work the machines are returned to the company's station in 52nd street, where they are inspected, washed, adjusted and put in order for the next day. The driver is held



Federal 3000-Pound Truck Owned by a New York Vegetable Dealer and Operated for a Fixed Charge Based on Mileage.

responsible for the operation of the truck and the owner need give no attention to its maintenance.

The benefits accruing to the customer are numerous. In addition to the economy derived, which is considerable, he has no garage rental, overhead charges, machine shop expenses, no lost time and no driver troubles. He does not have to worry about deliveries. He can estimate accurately to the penny what delivery service for a particular route or for the entire service costs for a day, a week, a month or a year. There is no uncertainty, and with these figures he can plan his service to meet any demand, and has an absolutely certain foundation upon which to expand his business in all its branches.

PRACTICAL MOTOR CAR REPAIRS

Many of the earlier types of motors are fitted with flywheels, shrunk and keyed to the crank shaft, and they usually are difficult to remove.

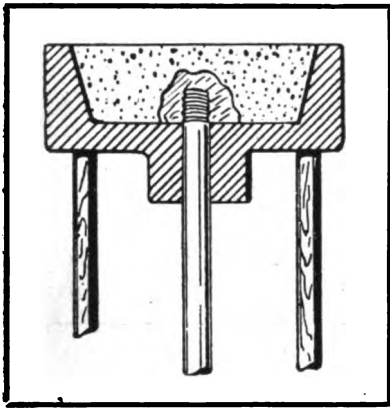


Fig. 70—A Removal Method to Which Stubborn Flywheel Will Yield.

However, the most obstinate of flywheels will yield to the method illustrated at Fig. 70. Obtain two pieces of planking, which are slightly greater in length than the crankshaft, and place them in an upright position, with the flywheel resting

on top ends and the shaft hanging down between the braces. Pack a little clay around the projecting end of the shaft and fill the cavity in the wheel with very hot molten metal. If the shaft does not easily separate from the wheel under this treatment, a slight tap with a copper or lead mallet will undoubtedly move it.

BORING HOLES IN GLASS.

There are many methods of making holes in plate glass, but one of the simplest which can be successfully accomplished by any motorist is shown in Fig. 71 B. Obtain a three-cornered file, the same size as hole desired, and grind the edges and the point. The file can now be placed in an ordinary carpenter's stock. Place a piece of cloth or waste on the bench and lay the glass on it. A putty mold should now be formed around the part to be drilled and the centre filled with turpentine. The hole can now be drilled in the ordinary way, using but slight pressure on the tool. It is imperative that the point of the file be kept moist with the turpentine.

METHOD OF TEMPERING TOOLS.

Several methods of tempering lathe tools are extensively used, but one of the best is as follows: Take an inside boring tool, as shown at Fig. 71 A, and heat it to the proper hardening temper to about a half inch from the cutting edge. Then plunge the entire tool, cutting edge down,

into a bath. The tool should then be polished with emery cloth as far back as X. Next heat a pair of blacksmith tongs to a white heat and grip the tool just behind the line. The hot tongs will draw the temper evenly. The temper should be drawn to a light blue and the part instantly cooled in a bath of cold water containing salt. Of course the size of the tongs used will depend upon the size of the tool.

ANGLE DROP LIGHT.

It is often necessary to direct the rays of an electric drop light in a particular place so that they will illuminate an object upon which work is to be done. The light may be tilted in any desired direction by attaching a small piece of string to the cable and a small hook made of wire secured to the other end of the string and fitted to the rim of the shade (see Fig. 72 B). The string may be lengthened or shortened according to the angle desired. The light may be cast in any direction by moving the hook around the rim.

SAFELY LOCATED SWITCH.

In garages where working space is limited, it is a dangerous practise to install an electric switch on the side walls, as contact with a piece of metal may cause injury to a workman. Usually a fit-

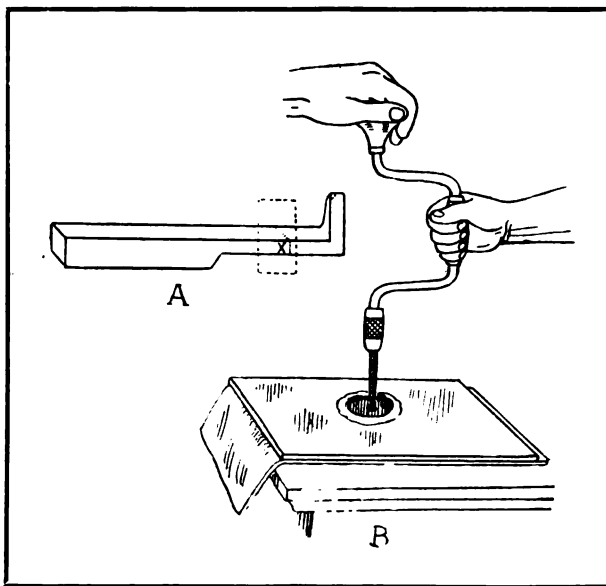


Fig. 71—A, Method of Tempering Small Metal Parts; B, Boring Glass with Improvised Tools.

ting similar to that shown in A can be made. Install the switch on the ceiling and at a point directly over the handle and on the ceiling, secure

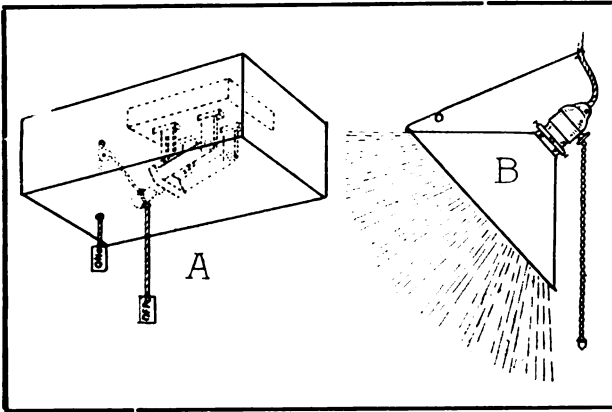


Fig. 72—A, Practical Guarding of an Electric Circuit Switch; B, Manner of Holding a Drop Light at an Angle.

a small block or hook. With a sharp knife cut a small groove around the handle of the switch and then attach a strong cord, taking care that both ends are left quite long. Pass one end of the cord through the block and allow the other end to hang free. At a convenient reaching distance the cords may be cut and a small tag marked "on" attached to the string passed through the block and a tag marked "off" placed on the free cord. If necessary the switch may be enclosed in a wood box, small holes being made for the cords to pass through, as shown in the sketch.

CHANGING TRUCK SPEEDS.

With many large trucks it is extremely difficult to reduce the gears of the transmission gear-set to get slower speed. To force a slower moving gear into mesh with a faster moving one causes noise, and generally serious wear on the gears and shaft bearings. This clashing can be avoided by rapidly kicking the clutch twice. For example, if a car is climbing a hill at high speed and it is necessary to shift to the next speed lower, this change could be made in the following manner: Throttle the motor and throw out the clutch, and then place the speed lever in neutral. With great rapidity let the clutch in and push it out again. This kick slows the gears of transmission to the slow turning of the motor and the result is that the two sets of gears will be revolving at approximately the same speed and the changing can be made easily and noiselessly. It should be distinctly understood that this double kicking must be done correctly, and quickly, because the momentum of the car must not be lost.

EASILY MADE PIPE VISE.

A smooth pipe or rod may be firmly held without denting in a smooth jawed vise by the following method. Obtain a square nut or other stock of the right size and place it on the arm of the vise, Fig. 73 B. The article to be held should be placed on the nut and when the jaws of the vise are brought closer together the lower corners will grip the piece. This method of gripping will not mark the surface and will securely hold smooth, round articles.

HOME MADE WOOD VISE.

A wood vise, such as is common in private garages, may be easily converted into a vise for holding metal pieces. Obtain an old 12-inch fine file, heat it and allow it to cool. It should then be cut so that two jaws may be secured. Two holes can then be drilled and countersunk. Now cut a recess in the wooden jaws of the vise with a chisel, a little less in width than the file. The pieces of file can then be hardened if desired and attached to the wood vise as illustrated at Fig. 73 A.

REPAIR OF OLD TIRE CASINGS.

Tires much worn in a section, in condition that does not warrant repair by an expert or an adjustment with the maker, may frequently be repaired by the owner so that a few hundred miles of service may be obtained. Carefully clean the inside of the casing with gasoline for about six inches on either side of the blow-out. From an old tire which cannot be repaired, cut a good section about 12 inches long and cut off the bead as at Fig. 74 B. Clean the outside of the patch with gasoline and trim the sharp edges to a feather shape. Apply three separate coats of

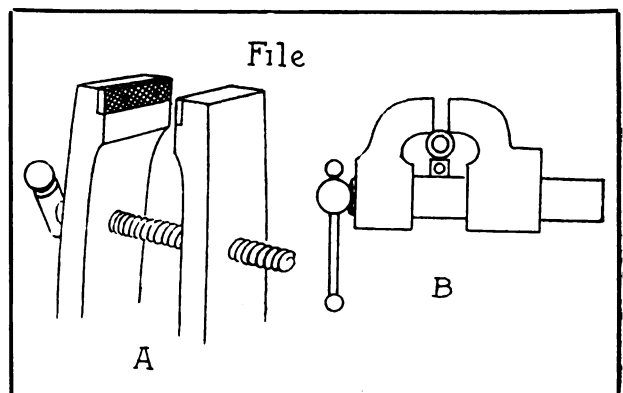


Fig. 73—A, Metal-Holding Jaws Fitted to Wood Vise; B, Method of Holding Round Material in an Ordinary Bench Vise.

cement to the inside of the casing and to the outside of the patch and when dry combine the two pieces after the same manner as a common tube

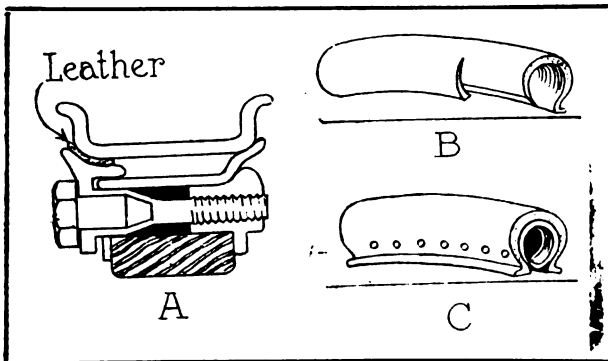


Fig. 74—A, Silencing Noisy Tire Rim with Leather Strips; B, Tire Section Trimmed for Fitting to Shoe; C, Section Cemented and Riveted in Place.

patch. Small holes can now be punched through the casing and the patch and small copper rivets inserted, as shown at C. A smooth piece of canvas should then be cemented to the patch to insure the inner tube against sharp edges and from being pinched.

REMOVING BODY STAINS.

Stains which cannot be removed from the body finish by washing with soap and water can often be eradicated by applying a soft cloth slightly moistened with paraffin. On many paints, however, the paraffin will stain, and when such a condition is known the paraffin should be applied to the whole body. About three applications a year will be sufficient to maintain a neat appearance. The effect of the paraffin on many points is to reduce the depth of the hue slightly. This is a safe remedy for stains, however, and is used extensively.

REPAIRING CRACKED FRAMES.

The only proper method of repairing a cracked frame is to have it welded. If, however, the motorist should have the misfortune to be in a section of the country where it is impossible to have the frame welded, a suitable repair can be made as follows: Shape a piece of steel, which is a trifle thicker than the frame, so shaped that it will fit into the frame and extend for at least six inches on either side of the crack, as shown in the illustration. Several $\frac{3}{8}$ -inch holes should then be drilled through the piece and frame and hot rivets firmly positioned by sharp blows with a hammer.

It is obvious that where conditions will permit, the more metal allowed on either side of the crack, the stronger the repair.

COMPRESSING VALVE SPRINGS.

After grinding the valves of large motors, it is many times found to be a difficult task to replace the valve springs. An easy and practical method is to place the spring lengthwise in a vise and gradually tighten it until it is fully compressed. Run two strong pieces of cord through the coils and fasten securely. Remove from the vise and adjust to the valve in the usual manner. When everything is set the spring may be released by cutting the cord with a knife.

STRAIGHTENING FRAMES.

Although a bent channel steel automobile frame can often be straightened while cold, it is considered the better practise to first heat the metal. A blow torch will generally serve this purpose. A length of wood should then be placed at the end of the frame, as illustrated, and a closed jack at the other end, the head just touching the end of the bent section. As the metal becomes hot the jack can be let out a little at a time until the frame is fully straightened. This method is better than hammering, as the action is gradual and the danger of cracking the metal is greatly reduced.

TO DRILL TEMPERED STEEL.

Removing a broken tap from a hole is not an easy operation and generally the most practical method is drilling. Usually the tap must be annealed before drilling, but if the cutting edge of the drill and the tap be kept wet with spirits of turpentine the drill will cut freely, although without this lubricant the cutting edge would simply wear off.

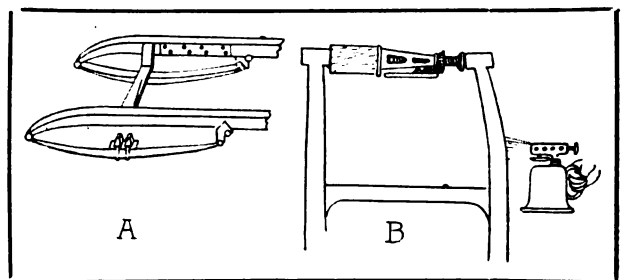


Fig. 75—A, Repairing Cracked Frame; B, Straightening Bent Frame with Jack and Blow Torch.

CARS ADMITTED TO YELLOWSTONE PARK.

BY ADMITTING passenger automobiles to Yellowstone National park, the government has radically changed the old order of things. The admission of cars to the park began Aug. 1 and while, for this season only, privately driven automobiles are admitted, the step doubtless forecasts the abolition of the old stage coaches.

The regulations under which cars are to be admitted have just been published. Only passenger vehicles are admitted and motorcycles will not be allowed in the park. Tickets permitting the trip cost \$5 for a runabout, \$7.50 for a five-passenger car and \$10 for a seven-passenger car.

Speeds are set at 12 miles per hour ascending grades, 10 miles descending, and eight miles near sharp curves. Automobiles in motion must keep 100 yards apart, except when they meet on the road. Teams and horses are really given the right of way and when automobiles meet them they must take the outside of the road until they pass, no matter in what direction they are going.

A complete schedule of travel through the park has been established. Checking stations have been set up where the car numbers will be taken, and the time checked up so that the speed of the car between stations can be gauged exactly. Fines will be imposed of 50 cents per minute for the first five minutes that the car arrives ahead of time, \$1 per minute for the next 20 minutes, and \$25 and ejection from the park, or both, for being more than 25 minutes early.

With an automobile the regular park tour can probably be made in three days. But much of great interest will be missed by tourists that go through it too rapidly. At the speeds established by the regulations much more time will be allowed at the main stopping places than was available under the old system. Private autos may visit many side points where the stages do not go. The use of these roads will, no doubt, lead the government to extend the road system considerably, and to the opening up of new parts of the park to travellers.

NEW LOG OF TEXAS ROADS.

For distribution by the El Paso Chamber of Commerce, Robert H. Rinehart and Harry Locke of the El Paso Automobile Club, have just completed a very detailed log of all the roads leading from El Paso in every direction. In addition to this route book, logs had already been made of the Borderland route, from Los Angeles east through San Diego, Phoenix, Tucson, Bisbee, Douglas, Lordsburg and Deming to El Paso, and from El Paso to Albuquerque via Elephant Butte



Along Yellowstone Lake, Near Thumb, in Yellowstone National Park—
Photograph by Courtesy of the Northern Pacific Railway Company.

dam, to connect with the Ocean to Ocean route from El Paso to Artesia and Roswell by way of Hueco Tanks and Hope; from El Paso to Alpine by way of Sierra Blanca Valentine and Marfa. The total distance covered is approximately 4000 miles. The new logs can be had by any one interested who applies to the publicity department of the El Paso Chamber of Commerce.

TRANSCONTINENTAL GUIDE BOOKS.

Transcontinental guide books, prepared by the Interior Department at Washington, primarily from the point of view of the traveller by train, but equally interesting to the motorist, are being placed before the public.

The first of four volumes dealing with the

Overland route to the Pacific has just been completed. It can be had for \$1 from the superintendent of documents. The next volume will deal with the Northern Pacific route, covering the National Parks.

The route is followed from station to station and the country along the way is very fully described and explained from many points of view: Human history, geologic history, agricultural and mining values—everything in fact that can make a car window landscape vital and interesting to the traveller.

The long stretches of prairie and desert, often dreary to the uninformed traveller, are made to teem with interest by the scientific and accurate information with which the books abound. One region may have possibilities of affording a livelihood for a pastoral people, another may be capable of intensive agriculture, still another may contain hidden sources of mineral wealth, which may attract large industrial development.

The books will answer almost any question that the average intelligent traveller may wish to ask. Much information already in the hands of the department was used in preparing the book, but to supplement the material three geologists last year made a field examination of the country along the route, while special topographical surveys for the 29 accompanying maps were made by the survey engineers.

The book is freely illustrated with half tones of scenery along the way and pictures of the strange beasts which inhabited Colorado and Nebraska when those states were great swamps. The fossil remains of these animals are now found in the rocks.

TOURING CHEAPER THAN FORMERLY.

Among the reasons prominently mentioned by the touring bureau of the American Automobile Association for the great increase in the number of tourists on the road this year, is that in every respect touring is much cheaper than it formerly was.

There has been a larger relative reduction in the cost of motor cars during the past 12 months, or for any other like period in the history of the automobile. Gasoline prices have been cut in half as compared to what they were a few years ago. Cost of tires and accessories has been greatly reduced during the same period. The cars that are made nowadays require far fewer costly repairs than those that were formerly available.

State registrations throughout the country show the biggest increase in new car owners that

has ever occurred in one year, and as most of the new owners will want to enjoy to the utmost the delights of touring for the first time, the interstate movement of motor cars during the remaining summer and fall months may be expected to exceed all previous estimates.

CANADIANS MUST HAVE N. Y. LICENSES.

An instance in which the "reciprocal" clause in the New York State automobile law, which reciprocates annoyance instead of privileges, is the announcement that Canadian motorists who enter the state at Buffalo must secure New York State licenses at once.

The same requirement has been exacted from New Yorkers by Canada for some time. Canadians who drove over on Sunday made the excuse that they could not get licenses on that day and were let go by the police. Now, however, a license clerk, on duty all day Sunday, will be at the Buffalo police headquarters and Canadians must buy licenses at from \$5 to \$50, or go to jail.

CHANGE LINCOLN HIGHWAY ROUTE.

Announcement has been made by the Lincoln Highway Association that after a year's consideration it has been found possible to change the route of the Lincoln highway in the east so that it will touch Washington and Baltimore. Those cities began a campaign a year ago for the change, and President Wilson requested that it be made. A committee of the district commissioners, headed by Robert N. Harper, has represented Washington in the negotiations. The road will curve north from Washington to Gettysburg and then follow the present line. This will add considerable mileage to the route, but that is felt generally by sight seeing tourists to be inconsequential.

BLUE BOOK TO ADD VOLUME.

Increase in touring and interest in good roads in the southeastern states has led to the addition of another volume to the series of Blue Books. Cars are now on the roads charting the territory and the book will be ready next year. Parts of this territory are covered in two other volumes—that for Pennsylvania and New Jersey and the one for the middle west. Many roads which were not previously covered will be logged for the new book.

CAR ACCESSORIES AND EQUIPMENT.

NEW CARLETON GENERATOR.

Lighting Equipment Adapted to Any Make of Car, Which Can Be Operated with or Without a Storage Battery.

The Carleton Company, 172 Summer street, Boston, Mass., is manufacturing the new Carleton No. 68 generator, shown in the accompanying illustration. This



New Carleton Generator.

electric lighting equipment is designed for service on all makes of cars and may be used with or without a storage battery. It produces a seven-volt direct current. A feature of interest is the new triangular drive, which eliminates belt slipping and excessive wear on the bearings. The average owner can install this outfit on the car, as no machining or chassis alterations are necessary. The generator is attachable with a screw driver and a wrench. A special equipment is made for Ford cars. This machine is declared to be of the best quality and workmanship throughout and retails at \$15. The company also manufactures automatic cut-outs, ammeters, storage batteries and several other electrical specialties. Full information will be supplied to those who mention this journal when writing.

A SAFETY FENDER OF NEW DESIGN.

Philadelphia Company Produces Device Which is a Combination Bumper and Fender for Saving Human Life.

A safety fender which will act as an ordinary bumper to protect the car when it strikes an obstruction or which can be instantly converted into a safety fender to pick up a pedestrian who may be hit has been designed and is placed on the market by the S. G. Safety Fender Company, Broad and Race streets, Philadelphia.

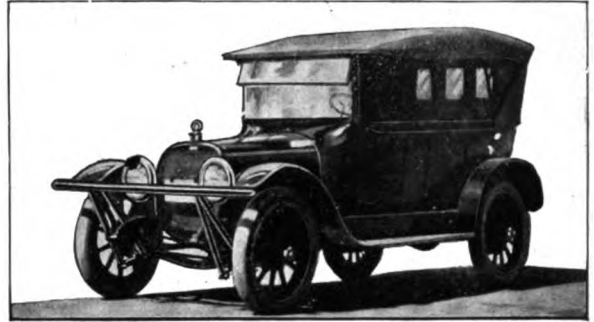
The device is said to be neatly designed and to add to the appearance of the front of the car. It can be at-



Glasgow Safety Fender When Used as a Fender.

tached in a few minutes by clamping to the front springs. In ordinary use it looks like the conventional bumper, but pressure on a button will drop it to within two inches of

the ground with a canvas pocket behind it. This acts like many types of street car fenders in picking up pedestrians who may be hit on the street.



The Glasgow Safety Fender When Used as a Bumper.

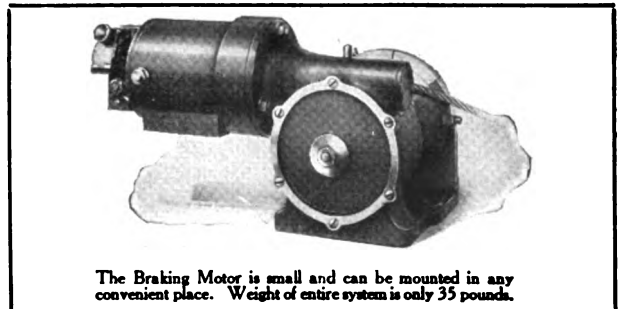
Further data regarding price or other points may be had from the maker if The Automobile Journal is mentioned.

HARTFORD ELECTRIC BRAKE.

An Electric Automobile Brake Which Operates in Oil and Gradually Reduces the Momentum.

The Hartford Suspension Company, 170 Morgan street, Jersey City, N. J., is the manufacturer of an appliance which uses electricity to furnish the braking power to the automobile. The Hartford method of braking is a departure from former methods. A film of oil remains between the contact parts and this must necessarily be squeezed out by the pressure of the brake before it reaches full effectiveness. This action gradually slows the car and prevents a sudden gripping of the wheels. So positive are the brakes in action that a car speeding at 50 miles an hour up to about 35 feet of a sharp turn may be easily slowed to 15 miles at the turn. The gradual gripping of the wheel reduces the momentum, so that there is practically none left when the wheels are stopped, thus eliminating skidding.

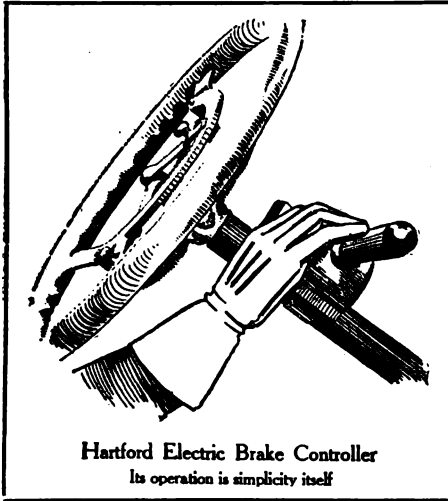
The system consists of a small electric motor, which is designed to pull on a brake cable at a pressure of approximately 1000 pounds. It is of the reversible type, high speed and series wound. The current can be supplied by either light or heavy voltage batteries, as provision is made to operate on different voltages. A worm at the end of the armature shaft drives a gear at a reduction of 100 to one. The latter gear in turn operates a drum by an internal gear at a reduction of four to one, making the total 400 to one. A steel brake pulling cable



The Braking Motor is small and can be mounted in any convenient place. Weight of entire system is only 35 pounds.

is wound on the drum and transmits the pull of the motor directly to the braking mechanism. The action is controlled by a small handle, which is placed within easy

reach of the driver, usually on the steering post. This controller can be placed in three positions, the first releasing the brake, the second supplying enough braking power for ordinary purposes, and the third sufficient for an emergency stop.



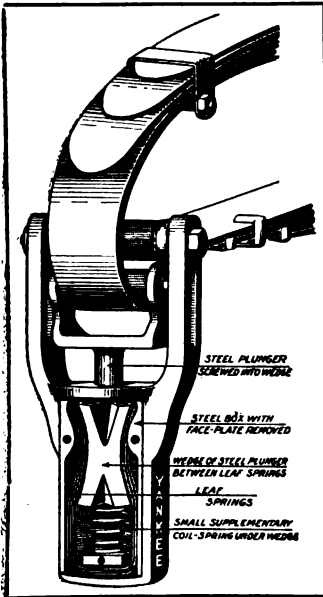
Hartford Electric Brake Controller
Its operation is simplicity itself

about a 40-ampere flow to apply a 1000-pound pull on the cable for 2/5 seconds. The Hartford electric brake is designed to replace the emergency brake, the foot brake remaining to be applied when wanted.

"YANKEE" SHOCK ABSORBERS.

"Yankee" Shock Absorbers Which Cushion Shocks by a Wedge Shape Plunger Between Leaf Springs.

The Simplex Auto Specialty Company, 733 Woodward avenue, Detroit, Mich., is manufacturing the Yankee shock absorbers for Ford and larger cars. The one shown in the accompanying sketch is for larger cars.



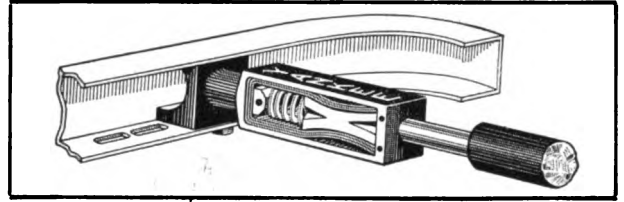
Yankee Shock Absorber.

The principle of operation is somewhat of a departure from previous methods in that the action is controlled by a wedge shape steel plunger situated between properly tempered leaf springs. When installing, the correct adjustment for the car may be obtained by screwing the steel plunger, which attaches to the upper half of the body spring, into or out of the wedge shape plunger. To further insure an easy resilient action, a small supplementary coil spring is placed under the wedge. Experience has shown that the absorbers do not stiffen the action of the body springs, and only operate when the car passes over an uneven surface.

The company lays emphasis on the fact that Yankee absorbers eliminate all side swaying of the car. The mechanism is packed in solid oil and is enclosed in an oil and dust proof case. Accessibility is possible by removal of the face plate of the case.

The retail price of a pair of Yankee absorbers designed for large cars is \$12, and \$15 for a set of four

adapted to Ford cars. This company also manufactures the bumper illustrated. An absorber designed on the principle described above is placed between the bar and



Simplex Yankee Bumper.

the car. The bumper is made of channel steel, finished in black and retails at \$12 for large cars and \$8 for Ford cars. They may also be obtained with a nickel finish for the additional charge of 50 cents. Dealers will be interested in the proposition being made by the Simplex company.

MAGNETO MAGNETIZER.

A High-Grade Magnet Charger Which Is Operated by Dry Cells.

The majority of motorists are under the impression that the magnetization of magneto magnets is a very delicate operation and can only be accomplished by experts. Usually when the magnets are presumed to be weak they are sent to the manufacturer, which is not only expensive, but causes great delay before the car can be again used. Any magnet can be instantly charged if the proper facilities are available, as the operation consists simply of placing the member on a high power charging plate and switching the current on and off.

To meet such a demand the C. C. McDonald Electric Company, Chenoa, Ill., is manufacturing a device at a reasonable price. It is a compact instrument, entirely enclosed in a wood case fitted with battery terminals and switch. At the top are two openings through which the magnet legs pass to the charging plates. At each opening is a letter, which designates the pole of the magnet to be placed therein. The determining of the different poles is a simple operation, as a special test magnet and compass are furnished with each outfit, as well as complete instructions for their use. When this has been determined the battery is turned on by pressing on the switch and placing the magnet on the charging plates, taking care to have like poles of magnet and magnetizer register. The magnetizing action being instantaneous.



McDonald Magneto Magnetizer.

Provision is also made for the charging of Ford magnets. The soft steel cores should be placed in the magnetizer chargers, and then the north and south poles of the Ford magnet found. It should then be set on top of

the cores and the battery switch pressed and then instantly released.

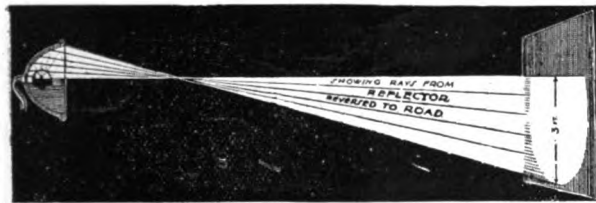
A feature of this outfit is that the power is generated by six dry cells connected in series. One set will magnetize several hundred magneto magnets, which makes the expense, after the first cost, very small, as it is only necessary to replenish the battery when it becomes run down. This is not often, however, as they last for long periods when subject to intermittent service of this kind. The complete outfit, which retails at \$15, should make for large economy to the owner on account of its rapid service and extremely low cost of operation.

LENNON LIGHT PROTECTOR.

Attachment for Dimming Glare of Headlights That Adequately Meets Requirements of City and State Laws.

To meet the requirements of cities and states in the matter of dimming the glare from automobile headlights, the J. H. Faw Company, Inc., 41 Warren street, New York City, widely known as the manufacturer of high-grade automobile specialties, is making the Lennon light protector, which is shown in the accompanying illustration. It is constructed of spring brass of high grade and heavily plated on both sides so as to give the greatest possible reflecting surface. As seen in the illustration, it fits over the lower half of the bulb and concentrates the rays upon the lamp reflector, from which they are directed in a downward and outwardly direction and never in the eyes of pedestrians or autoists. The intensity of the light is not diminished, only concentrated to the point where it is most needed.

The Lennon light protector adequately meets all requirements of state and city laws governing headlights, and has been widely indorsed. One of the latest indorsees is the department of Motor Vehicles of the State of New Jersey.



How Lennon Light Protector Deflects and Concentrates Light Rays.

The protector is easily attachable, is interchangeable and will fit under or over size bulbs, and is practically indestructible. They retail at \$1.50 a pair.

"OLD SOL" PENCIL FLASHLIGHT.

Combination Flashlight and Pencil Which Illuminates the Paper When Writing in the Dark.

The combined pencil and flashlight, made by the Hawthorne Manufacturing Company, Inc., 35 Spruce street, Bridgeport, Conn., is a decided convenience to anyone who must write in the dark, and it is especially valuable to the motorist who must have a trouble light. Designated as the "Old Sol" No. 57, it is as ornamental as the average fountain pen and is finished in polished nickel. By pushing the pencil forward in the holder the

current to the light is automatically turned on, although it may be operated independently by manipulating the thumb slide in the pencil barrel. Sufficient light is given



for ordinary trouble requirement. It is sold complete, including battery, bulb and pencil, for \$1, and is fully guaranteed.

BURNOX TABLETS.

Tablet Which Generates Oxygen and Removes Carbon—A Special Offer Made to Dealers.

The Burnox Company, Milwaukee, Wis., is making a very interesting business proposition to dealers. With each order of three dozen boxes or more of Burnox tablets, the company will make a present of a number of additional boxes of the same size as designated in the order. The number of free boxes is of course proportionate with the order.

Burnox is a compound in tablet form to be inserted into the cylinders through the spark plug holes. The tablets when subjected to heat generate a certain amount of oxygen, which unites with and burns the carbon deposits. Delay is unnecessary; after the tablets are dropped in the cylinders, the car may proceed. The burned deposits are ejected through the exhaust. Two tablets to a cylinder are ordinarily sufficient to maintain a thoroughly clean motor.

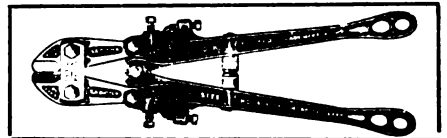
The tablets are packed in boxes containing lots of 16 and 40 and retail at 50 cents and \$1 respectively.



O. K. CUTTERS OF NEW DESIGN.

Tool for Trimming Annealed Bolts and Soft Rivets and Rods, with Provision for Adjusting Cutting Jaws.

O. K. cutter No. 14, which is manufactured by the H. K. Porter Company, Everett, Mass., may be obtained with two types of jaws, one having a large bevel on the top side and a small bevel at the bottom side, designed for trimming rivets or other work requiring a nearly flat end, and one having bevels nearly equal and the cutting edges in the centre of the jaw. The former, or clipper cut jaws, will cut up to ¼-inch annealed bolts or ¼-inch soft rivets. The centre cut jaws will cut ¼-inch soft rods. A time saving feature is the ability of the tool to be taken apart with a wrench, except for one rivet, which can be easily driven out if necessary. The device measures 14 inches and weighs two pounds and five ounces. Ample provision is made for the adjusting of the cutting edges. In writing for further information please mention The Automobile Journal.



O. K. Cutter No. 14.

BRIGHT-RAY LIGHTING SYSTEM.

A Complete Lighting System Which May Be Installed on Any Car—Every Part Guaranteed for One Year.

Paul G. Niehoff & Co., 350 North Clark street, Chicago, Ill., is co-operating with the dealer in the sale of the Bright-Ray lighting system by issuing a guarantee that

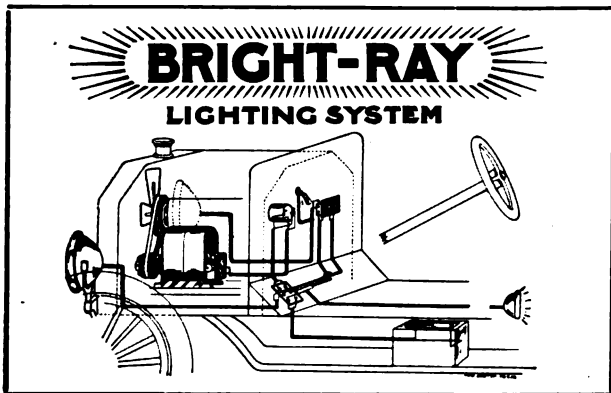


Illustration Showing System Assembly.

If the system fails to charge any six-volt battery to its rated output the company will replace the system or refund the purchase price. The Bright-Ray electric lighting system is adapted to Fords as well as to all other cars now on the market.

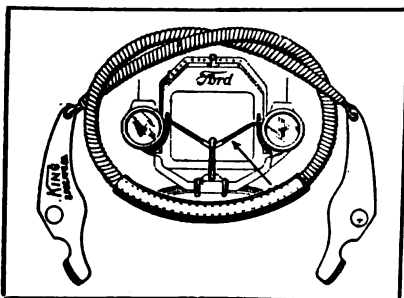
It is self contained, requiring no adjustment, and consists of a high-grade magneto type generator, which produces six volts at normal speed. The instrument is fitted throughout with ball bearings. A centrifugal governor automatically controls its speed, thereby eliminating any possibility of overcharging. The equipment also includes a relay, or cut-out, which breaks the current when the battery has been sufficiently charged.

A high-grade dimmer switch, complete wiring assembly, attaching brackets, pulleys, belts and other equipment complete the outfit, which retails at \$29.50. Any part defective in material or workmanship will be replaced f. o. b. at the factory within a period of one year after purchase. The Niehoff company also manufactures a high-grade six-volt, 60-ampere storage battery, which is retailed at \$10. Two electric head and one tail light may be secured for \$6.50. Dealers should write for agency prices and discounts.

ANTI-RATTLER AND CRANK HOLDER.

Attachments Which Prevent Rattling of Spindle Joints and Maintain Crank in Upright Position.

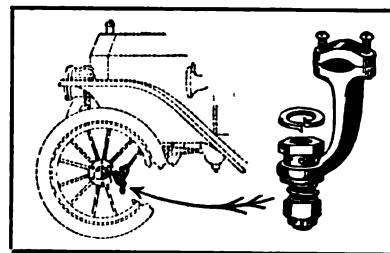
Two specialties manufactured by the King Specialty Manufacturing Company, Brookline, Mass., which are designed to attach to the Ford car, are shown in the accompanying illustrations. The King spindle-joint anti-rattler is said to permanently eliminate all noise caused by the spindle joints. This attachment also prevents the dangerous slap, resulting from loose joints, which is often felt at the steering wheel. Attachment is simple and when the



King Crank Holder.

device is installed properly it requires no further attention. It detracts in no way from the appearance of the car, and is very effective in the service for which it is designed. The Anti-Rattler retails at \$1 the set.

The King crank holder attaches to the headlights and prevents vibration of the lamps and the breakage of the bulbs. The crank is held in a vise-like grip, in an upright position. This keeps the crank out of the mud and also prevents vibration and excessive wear on the parts. The holder retails at 25 cents. It is extremely serviceable and practically indestructible. When writing to the manufacturer please mention this publication.



King Spindle-Joint Anti-Rattler.

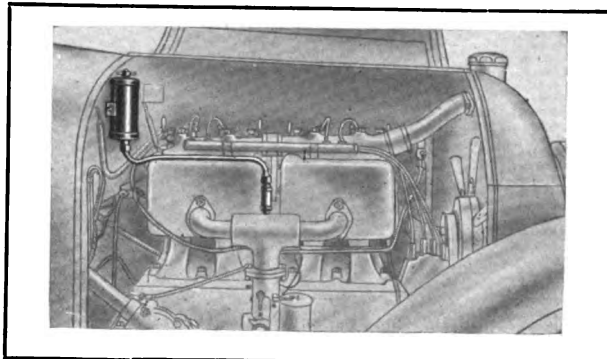
CARBON REMOVER.

Appliance Which Perfects Carburetion and Removes Carbon from Gasoline Engines by Injecting Moisture.

Some of the claims made for the gas economizer illustrated herewith and manufactured by the Triplex Gas Economizer Company, 223 West 49th street, New York City, are that it will perfect carburetion, decrease the consumption of fuel from 10 to 40 per cent. and automatically remove carbon from cylinders, valves and plugs. It consists of a brass water tank which can be attached to the dashboard under the hood. Connection is made to the intake manifold by a pipe line, which enters at a point above the carburetor. The action is automatic, positive and effective.

The tank is constructed of a copper tube, covered with absorbent material, which passes down through the centre, with a water tight valve seat at its lower end. This is held in a closed position by a spring at the top. There are two milled slots at the upper end of this tube and four round holes in the top cover of the tank, through which air is drawn over the water and into the mixture at the manifold. The air passing over the water develops a high degree of moisture.

The construction of the automatic valve is such as to effectively atomize and mix the moisture with the mixture in relative proportion to the speed and pull of the engine. When the cylinders are heavily carbonized the motor is operated at a high rate of speed until a high temperature results, and then the check valve is opened so as to allow the water to run into the warm combustion chambers, where it is immediately converted into steam. The steam loosens and cuts the carbon and ex-



Gas Economizer and Carbon Remover.

pels it through the exhaust valves. Once the carbon is thoroughly removed it is impossible for further accumulation.

KING ADDS ROADSTER TO LINE.

Cylinders of Eight-Cylinder Motor Are Enlarged to Provide More Power—Price Remains the Same as Last Year, \$1350.

THE King Motor Car Company has declared against the policy of making what it terms "a mid-season announcement," but it has added to its line a new car, a roadster body mounted on the regulation King "Eight" 113-inch wheelbase chassis, and has improved the chassis by increasing the volume of the motor cylinders.

The motor is a V type with two blocks of four cylinders set at an angle of 90 degrees. The cylinders are L head design, with intake manifold and heads integral with each block. The cylinder bore has been increased from $2\frac{3}{4}$ inches to $2\frac{7}{8}$ inches, and the valve ports have also been increased in diameter. The motor has a larger intake manifold and is fitted with an improved type of Zenith carburetor.

The valves are operated from a single drop forged camshaft with integral cams through intermediate rocker arms, which have hardened steel rollers and adjustable push rods. The camshaft, like the oil pump, is driven by a silent chain running in oil at the front of the motor. It is carried on three bearings, that in front being phosphor bronze, $3\frac{3}{4}$ inches length, the centre babbitt, $1\frac{3}{4}$ inches length, and the rear babbitt, $2\frac{1}{2}$ inches length.

The crank case is aluminum casting, in which are three babbitt bearings in bronze shells $1\frac{11}{16}$ inches in diameter and three inches length at the front, $1\frac{3}{4}$ inches length in the centre and four inches length at the rear. The connecting rods are drop forged, with $1\frac{11}{16}$ by $2\frac{3}{8}$ -inch bearings of babbitt-lined bronze in the big ends. Each pair of connecting rods, one from a cylinder on each side, operates a single crank. All rods on one side are forked and the single ends of the opposite rod are assembled between the forks, both rods thus working on a single crank bearings.

The base of the crank case forms an oil reservoir, from which lubricant is drawn by a gear

pump to supply each main bearing from which the oil flows through drilled crank arms to the connecting rod bearings, the cylinders, pistons, cams, pushrods and wristpin bearings being lubricated by oil thrown off by the crank.

The thermo-syphon cooling system is used, with a $\frac{5}{8}$ -inch water jacket and a cellular radiator with a 16-inch fan. A Ward-Leonard electrical control, with a Willard storage battery, is used for both lighting and ignition. The Zenith carburetor is mounted between the cylinder banks.

A multiple disc clutch of the cork insert type, which has 17 bronze plates running in oil, is



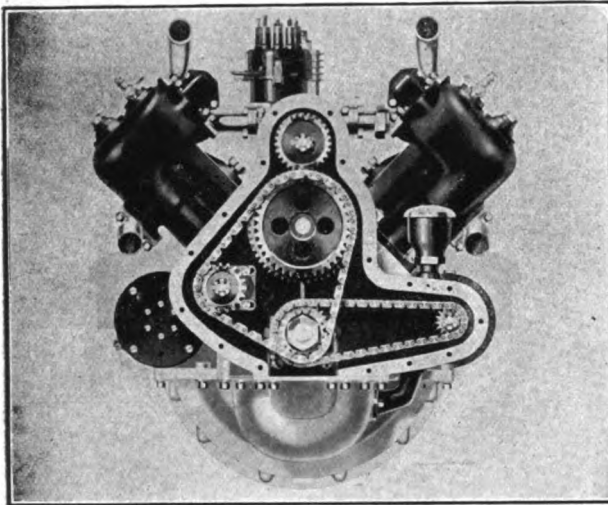
New King Roadster Model with Seating Capacity for Three Passengers.

mounted immediately behind the motor, as is the three-speed gearset case. The gears have $6/8$ -inch pitch and $7/8$ -inch face. The direct drive propeller shaft is enclosed in a torque tube. The full floating rear axle is carried in a pressed steel housing running on high-grade ball bearings. Internal and external brakes operate on 14-inch drums on the rear wheels.

The front axle is an I beam drop forging and all wheels are artillery type with demountable rims and 33 by four-inch tires. The steering gear is an irreversible worm and gear type, located on the left and operated by an 18-inch hand wheel. The control levers are in the centre. The service brake is operated by a pedal and the emergency

brake by a hand lever. The gasoline tank is at the rear, with air pressure pump feed.

Cantilever spring suspension is used at the



End View of King Motor, Showing Silent Chain Drive of Lay Shafts.

rear, with overslung semi-elliptic springs in front. The frame is a pressed steel four-inch channel section with a three-inch flange and 5/32-inch side rails.

The regular equipment includes an engine tire pump, rain vision ventilating windshield, silk-mohair one-man top of extra rigid design, with quick attachable curtains, a Jones speedometer driven from the propeller shaft, an electric horn operated from a button in the centre of the steering wheel, tire irons, pump, jack, tire repair outfit, tools and extra rim.

The instrument board contains the electric light and ignition switches and the speedometer, which is electrically lighted.

The body of the new roadster is especially roomy, with the following dimensions: Dash to front seat, 29½ inches; floor to top of cushions, 13 inches; thickness of cushions, eight inches; width of seat, 43 inches; front of seat to seat back, 18 inches; top of cushion to top of seat back, 19 inches. The body, hood and radiator are painted crimson lake, while the fenders are finished in black enamel. The chassis is black. Natural wood wheels are supplied as regular equipment.

Rear tires are 33 by four-inch non-skids, and front are the same size with smooth tread. One extra rim is included in the regular equipment.

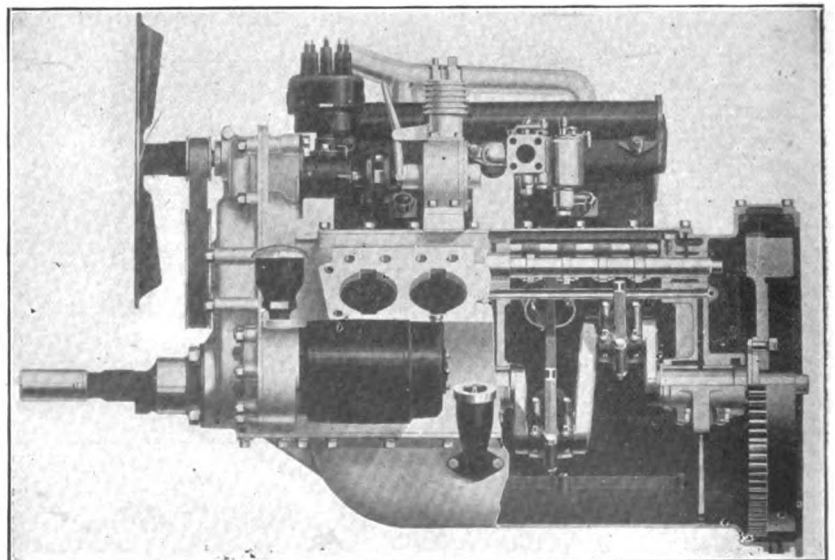
The price of the roadster is the same as for the touring car, \$1350. The touring car remains the same for the year, except in the minor chassis details, which have been mentioned. The finish of the body is United States mail blue, with black hood and fenders, black and nickel trimmings and straw colored wheels. The doors are a full U type, with concealed hinges and invisible latches.

The sale of the car since it was put before the public at the New York show has been on a large scale. It was the second eight-cylinder car to be announced, and it was also one of the first cars sold at the new level of prices which has swept the whole industry during recent months.

Its lack of vibration, its great flexibility, and its possession of all the qualities which have won so great popularity for the eight-cylinder type have created a large business. Early in the season train load shipments were made to the dealers in large centres and the factory has been working at capacity since the new car was first announced.

The King company believes that this model when it was first announced was a year ahead of the industry, in both design and price, and that only now have other makers designed and begun the manufacture of cars that directly compete with it. In these circumstances it has not thought it necessary to bring out a new design at this time, but will continue the old one through the season.

The practise of many makers of making an-



Partial Sectional View of King Eight-Cylinder Motor.

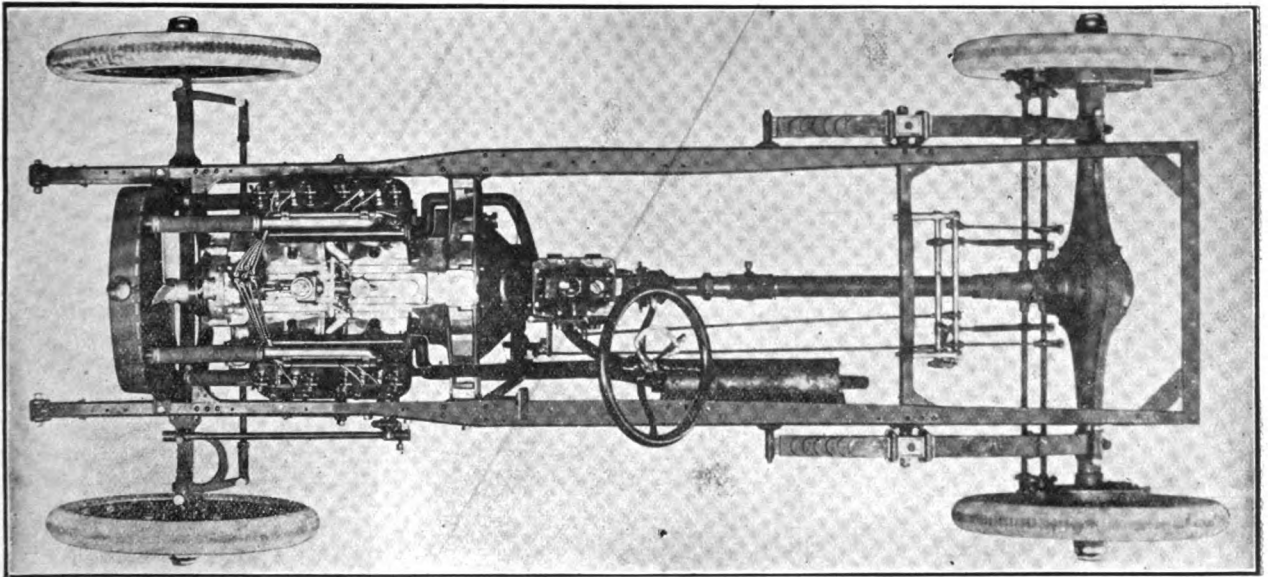
nouncements in the middle of the selling season is not approved by Artemus Ward, Jr., president of the King company, and Vice President and General Manager Vollbrecht. They believe that such announcements disturb the dealers' business at a time when he should be devoting his undivided energies to sales and that they have a tendency to load him with used cars at a time of year when these are likely to eat a large share of his profits before they can be disposed of.

The new officers have announced a policy of broad liberality in their relations to dealers as a means of developing a strong and substantially founded business. They do not believe in encouraging the owner to feel that he should have a new car every year, as that has become unnecessary in the present advanced state of motor car development.

company's business have been strengthened recently by the acquisition of men of long experience in the automobile business. The company has a large modern plant with the most complete equipment. The stock in the corporation, held largely within the company has never been on the open market. For that reason it has been able to plan boldly and carry out its plans with a minimum of delay.

HUPMOBILE COUPON SERVICE.

The Hup Motor Car Company has adopted a coupon book system of service. A book entitling each purchaser to 50 hours of labor is given with every car sold. The book contains 100 coupons, each of which entitles the purchaser to half an



King Chassis, Showing Unit Power Plant and King Cantilever Rear Spring Suspension.

At a recent convention of distributors the company explained that it would make no yearly announcement at this time and that, if in the future one should be made involving a change of price, King dealers would receive rebates covering the difference between the new and the old prices on all cars bought for a month before the announcement became public.

The King Motor Car Company has been making motor cars for many years and claims to have been the first company to operate an automobile in Detroit, in 1894. It is said also to have been the first American company to adopt the block system of motor casting, centre control and the use of cantilever springs.

Both production and sales divisions of the

hour of service labor. Special Hupmobile service stations are designated in every town where these coupons will be accepted. The work is done under the supervision of the Hupmobile dealer for the territory, who in turn works directly under the factory service department. This system makes it possible for the owner to get service in any locality and assures him that if the dealer who sold him the car should cease to handle the car or go out of business his needs will still be cared for.

The opening meeting of the Indiana section of the Society of Automobile Engineers will take place on Sept. 24, instead of the 17th, as originally set. The programme promises a big meeting.

SAN FRANCISCO AND MOTOR TRUCKS.

JUST south of San Francisco there is a level stretch of ground that is ideal for residential purposes, but has been cut off from the city by the towering Twin Peaks. It would still be inaccessible, it is generally acknowledged, if motor trucks were not in existence.

Market street ended abruptly against the steep sides of the peaks. Various plans of continuation have been projected, but abandoned because of the prohibitive cost. However, the coming of advanced construction methods, not the least of which is the motor truck, changed the complexion of affairs, and recently the progres-

which indicates that the Postoffice Department will soon become an extremely large buyer of motor vehicles. He announces that a large number of additional motor trucks will be furnished various cities so that they can extend their delivery radius into the territory now covered by rural routes.

It is the plan eventually to supply enough motor cars to cover all the mail routes inside of a 25-mile circle from each city in every direction. A very large number of cars will be required when this service is in full operation.

On Aug. 2, 105 new machines were put in operation at this work. Of the routes selected, because road and other conditions make them suitable for motor working, 44 are in Oklahoma, 28 in Georgia, 19 in California, eight in Texas, three in Florida, two in Pennsylvania and one in Louisiana. They aggregate 5500 miles in length, each being from two to three times as long and serving more than twice the number of people served by the old horse routes.

Remarkable economy has been accomplished through the operation of trucks by Postmaster Otto Proeger of Washington, D. C. He reports that nine trucks, operated directly by his department, are doing at a cost of 9½

cents a mile, work that formerly cost 37½ cents a mile under the contract system. This cost includes depreciation and all legitimate charges. Cost of delivering parcels has been reduced from 7.04 cents to 3.05 cents in Washington.

TRUCKS IN HONDURAS.

While there are few roads in Honduras at present that motor vehicles could be operated upon, there are almost no railroads there. In the opinion of the American minister, if trucks could be shown to operate successfully over such roads as now exist, it would be possible to secure a gradual extension of highways built by the government. This might make the truck the future means of inland travel to the exclusion of railroads.



Two White Trucks Used in Hauling the Excavated Material from the Twin Peaks Tunnel at San Francisco.

sive San Franciscans began to tunnel the hills.

The tunnel, so called, is a gigantic bore 2¼ miles through the peaks. Construction plans specify an arched roof 15 feet above a 30-foot roadway. The contractor for the work has a fleet of five-ton White trucks in his service, and the economical haulage of excavated material with them will reduce the cost of the tunnel materially.

The machines can be turned around in the tunnel, and are quickly loaded and discharged, a large part of the earth and rock being used for filling at other places.

POSTOFFICE TO USE MANY TRUCKS.

A plan for the use of motor trucks has just been approved by Postmaster-General Burleson,

BRITISH WOMEN AS TRUCK DRIVERS.

A LONDON company, which operates numerous taxicabs and light delivery wagons, is employing four women drivers. Since the war began practically all the trained men who know motors have gone to the front and the drivers who are obtainable are not only unskilled, but very poor material for skilled mechanics.

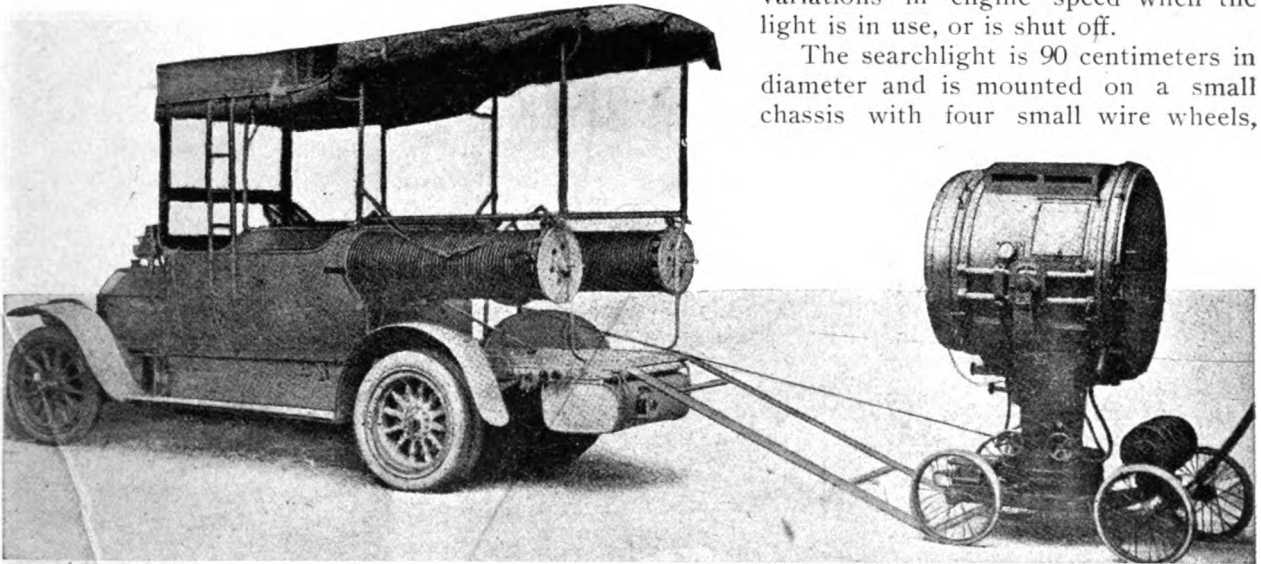
The four women employed are those who formerly owned and drove their own cars. They found themselves in serious financial difficulties owing to the war—one of them is a singer—and knowing of the shortage of good drivers applied for the positions.

So far they have been very successful at the

signed to carry a load of three tons. The motor develops 35 horsepower, wheels are shod with pneumatic tires, the rear wheels having the dual type. When loaded the car will attain a speed of 30 kilometers an hour. The dynamo, driven by the motor, is of the enclosed type and will produce current of 80 volts at 100 amperes. It is fitted above the change speed gear box.

The dynamo is driven from the transmission shaft through the medium of two toothed wheels and a silent chain. It is thrown into or out of gear by a lever placed on the exterior of the body work. A magnetically controlled governor acts upon the carburetor in such a way as to prevent variations in engine speed when the light is in use, or is shut off.

The searchlight is 90 centimeters in diameter and is mounted on a small chassis with four small wire wheels,



Motor Searchlight of 60,000,000 Candle Power Used in Italian Army.

work, giving much better service than many of the men drivers who are employed. They are at a considerable disadvantage, of course, as to physical strength and they have not been tried out on heavy duty trucks.

As a result of the war, wages in nearly all trades have been increased by one or two cents an hour, which on the English scale amounts to from 10 to 12½ per cent.

ITALIAN MOTOR SEARCHLIGHT.

A 60,000,000 candle power light can be projected at the enemy by a motor searchlight supplied to the Italian army by the Fiat company.

It is mounted on a Fiat chassis, which is de-

signed to carry a load of three tons. The motor develops 35 horsepower, wheels are shod with pneumatic tires, the rear wheels having the dual type. When loaded the car will attain a speed of 30 kilometers an hour. The dynamo, driven by the motor, is of the enclosed type and will produce current of 80 volts at 100 amperes. It is fitted above the change speed gear box.

A cable over 100 yards long is rolled on two spools. This connects the light with the dynamo when it is in use at some distance from the vehicle.

WOMEN IN FRENCH FACTORIES.

The scarcity of men with or without mechanical training in France has made it necessary for some of the automobile factories turning out both motor vehicles and ammunition to employ women workers.

Out of 2800 people employed in the De Dion Bouton shops, 600 are women. A large number of them are working on lathes as turners, but there are a certain number occupied on automatic machinery; some make shells and others act as inspectors.

The chief difficulty experienced so far is that it is necessary for a first-class mechanic to fit up the tools and place the material which the women are to turn. This is due chiefly, perhaps, to their inexperience. A few women who worked in the factory before the war are able to attend their own machines and are really good mechanics. Many of these have been made forewomen over important departments.

The women are paid from eight to 12 cents an hour. They have proved to be punctual and careful, lose no time rolling cigarettes and are seldom absent Mondays or days after a fete. After the war there is expected to be a considerable shortage of trained men in France and it is possible that women will be continued in considerable number in mechanical employments.

MOTOR TRICARS FOR WAR VICTIMS.

Since the war began in Europe and thousands of men have come back from the front wounded, it has been necessary to call upon American manufacturers to secure an adequate supply of wooden legs. For the same reasons a great market has developed for tricycles with motor equipment, and other sorts of conveyance for cripples.

In a recent report American Consul H. D. Van Sant of Dunfermline, Scotland, says that a small car to sell for \$500 or less, which would be a good hill climber and could be safely and easily handled on steep descents, would meet with a large sale in his territory. Several inquiries have already been made at the consulate for a car of this type that could be guided entirely by hand without the need of foot action.

The probable demand for such a car during the first year is set at 20,000, with a large market constantly thereafter. The demand for American light cars continues brisk in the consul's district, but many dealers are holding off until after the first of the year before taking up the sale of American cars in the hope that the English factories will by that time be turning out machines for private use.

FEAR AMERICAN DESIGNS.

The eruption of eight and 12-cylinder power plants of entirely new design in this country,

while Europe has been too busy with the war to do anything new in motor car building, is looked upon with much misgiving by the Autocar, the leading English motor publication. It says in a recent editorial:

"What we have to bear in mind all the time is that hitherto Europe has led in design. At the present time, owing to the war, England has done comparatively no new designing for 1915. On the other hand, America has very largely redesigned its cars and is showing an activity in the designing department which is greater than anything it has exhibited before in that way.

"It is therefore obvious that if Europe wishes to retain its share of the home markets, not to mention those beyond the seas, it must keep in mind that one of its valuable assets has been that it has led in design. Although makers may imagine that the 1914 models which they had when the war began are good enough to sell when it ends, they will find themselves hopelessly outdistanced by the Americans, who will have had new designs, once, at least, and, if the war lasts many months longer, twice during a period when European automobile designs has hardly changed at all."

FIRST ELECTRIC IN EDINBURGH.

The city of Edinburgh, Scotland, has recently purchased and placed in service the first electric vehicle, either pleasure or commercial, that has ever been used there. The committee in charge of the city electric light plant is inaugurating a policy of encouraging the use of electrics.

The car is an American make, with Edison batteries, for which a charge of 35 kilowatts are used. On this it will carry a load of 1½ tons 40 miles. The cost per kilowatt is two cents, so that operating cost for power will amount to only 1¾ cents per mile.

INTERNAL GEAR NEWS.

The Internal Gear Drive Association has begun the publication of a booklet that bears the name of Internal Gear News. This will be issued at intervals of several weeks to cover subjects that do not come within the field of the ordinary trade news, and will be circulated among dealers and users. Since last winter all the truck and axle manufacturers represented in the association have doubled their capacity and still further enlargements are expected. This is not due to war orders, but to expansion of domestic business.

CAMPAIGN FOR UNIFORM AUTO LAWS.

RULES of the road inherited from the era of horse drawn vehicles are practically uniform in all the states of the United States. Cars are expected to drive on the right side of the road, pass approaching vehicles on the right side, and those going in the same direction on the left.

In almost all other requirements the states differ. To remedy these conditions the American Automobile Association, the Lincoln Highway Association, which crosses many states, and hundreds of other motoring associations are to join in a great campaign to secure uniform road legislation.

The annual conference between the governors of the various states will be held in Boston this year and the matter of similar automobile legislation all over the Union will be taken up at that time. To help along this movement a commission in New Jersey has drawn up a comparison of the automobile laws of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Maryland and Delaware.

For 10 years this subject has been agitated more or less constantly by motorists, but with the great increase in the number of motor cars used and the bringing of more and more people to the motorists' point of view, the likelihood of success is greater.

Few persons operating a car from Baltimore to Bar Harbor would be sure of the laws regarding speed in the states through which they would drive, the requirements regarding the registration of non-residents are equally at variance. The same conditions would be found in any other group of contiguous states anywhere in the Union.

One of the first questions which a tourist outside his own state asks is regarding the laws covering the registration of visiting car owners. There are no restrictions in New York, Connecticut or Delaware. The owner who has complied with the laws of his own state may operate his

car without fear of consequence.

In Pennsylvania and Vermont a motorist is exempt only in so far as his own state reciprocates the exemption. The New York, Connecticut and Delaware residents may operate their cars in those states indefinitely on the registration made in their own states.

Non-residents who are registered in their own states may operate for 10 days in Massachusetts provided the states from which they come reciprocate the privilege. The same length of time is allowed them in Rhode Island and New Hampshire. In Maine the limit is 30 days, and in New Jersey 15 days. For periods in excess of those mentioned the machine must be registered in the alien state.

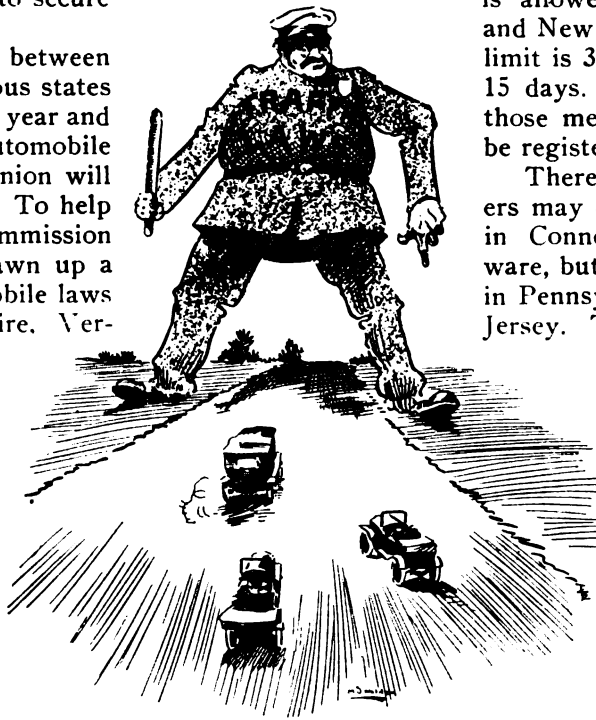
Therefore, Massachusetts owners may operate without time limit in Connecticut, New York, Delaware, but may operate only 10 days in Pennsylvania, Vermont and New Jersey. This is brought about by the reciprocal clauses by which the laws of his own state determine the privileges granted in Pennsylvania and New Jersey.

The Maryland law is different from the others in having no free or reciprocal period. A permit from the highway commissioner allows them to operate for no more

than seven consecutive days. The governor of the state may extend the privilege, however, at his own discretion.

Massachusetts and New Hampshire offer a special summer license to non-residents of half the usual fee for July, August and September. Vermont does the same, but the fee is only one-fourth the usual amount.

In addition to registration of the car driving licenses are required in all states mentioned except New York and Pennsylvania, where professional chauffeurs only are required to be licensed. In addition to a single driving license of \$5, Delaware issues a special family license, including all members of the owner's immediate family who are over 16 years of age, for \$8.



Most motor vehicles on the open road travel occasionally from 22 to 30 miles an hour, but the Massachusetts law holds that a speed of over 20 miles an hour is *prima facie* evidence that the driver is not driving with due regard to the safety of traffic and the rights of others. Delaware sets the same limit and requires in addition that speed must be reduced to 12 miles going down steep hills or passing a vehicle going in the other direction.

Speed Limits Are Different.

Connecticut law allows a speed of 25 miles per hour, but speeds exceeding that for more than a quarter of a mile are *prima facie* evidence that the motor vehicle is being recklessly operated. Maine, New Hampshire, Rhode Island, New Jersey and Vermont fix 25 miles as the maximum. Pennsylvania permits 24 miles an hour and New York 30. In Massachusetts excess of eight miles per hour when the driver's view is obstructed is regarded as reckless, and Vermont, New Hampshire and Maine so consider more than 10 under the same circumstances.

The Connecticut law requires that an automobile be throttled down to three miles an hour when passing a street car on the side where passengers are alighting. The state also specifies that the machine must be under control when a pedestrian is passed. Motor vehicles must slow down when crossing an intersecting highway and must slow down and sound the signal when approaching a school.

Thickly settled portions of a city are defined in most of the laws as those sections where the houses are less than 100 feet apart. If houses are more than 100 feet apart, the district is held to be thinly settled. In thinly settled sections of a city or town Maryland sets a maximum speed of 18 miles an hour, New Jersey 12, Massachusetts 15, Rhode Island 15 and New Hampshire 15.

Publicity for Community Rules.

All extra rules made by communities must have full publicity in the form of conspicuous signs along the roads. This is true in all states. While communities are allowed to close certain parts of certain roads to motor vehicles, they are

not allowed to close state highways. New York and Pennsylvania forbid municipalities to limit maximum speed to less than 15 miles per hour, and in Connecticut no municipal regulations are permitted. Towns in Maine are allowed to make special speed regulations over certain parts of the road provided conspicuous signs are erected, such as "Speed Limit Five Miles Per Hour" or "Automobiles Go Slow." In Massachusetts if roads are closed notice must be given in the newspapers. In Massachusetts also the Metropolitan park commission has power to bar motor vehicles from any streets under its control.

All of the states except New Jersey require two front lights visible 200 feet and a rear light showing red behind and white at the side which is visible 60 feet. In New Jersey the front lights must be visible 250 feet.

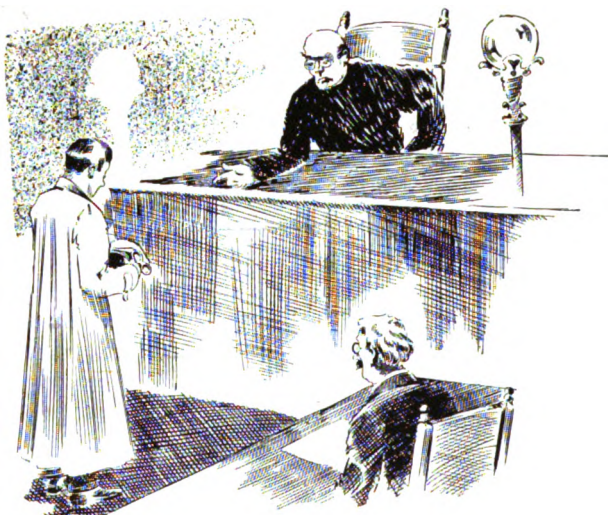
In Maryland, Delaware and Maine no distance is mentioned at which the rear number tags must be visible. Lamps must be lighted half an hour after sunset and half an hour before dawn in Maine, Massachusetts, Connecticut, New Hampshire and New York. In Delaware, Maryland, Rhode Island, Pennsylvania and New Jersey the time is one hour after sunset and one hour before dawn. Vermont sets the

time at 45 minutes. New Jersey requires lamps when fog makes it difficult to see long distances.

Except in Rhode Island and Vermont it is required that when a car is left unattended the brakes be set or it be locked so that it cannot be started by an unauthorized person. Maryland requires that the motor be stopped when a car is left alone. New York City has numerous very stringent regulations, most of which are designed to prevent congestion in crowded streets.

Regarding the attachment of numbers the regulations vary greatly. They must be visible from both front and rear and must not swing. If they are attached more than 18 inches from the ground and less than 36, no objections will be met in any of the states.

Louisiana has passed a recent speed law which does not set definite miles per hour restriction, but judges the justification of any rate of speed upon traffic and road conditions.





BEAUTY of finish, luxurious upholstery, very roomy bodies and tried and efficient mechanical construction are the qualities on which the Auburn Automobile Company of Auburn, Ind., depends to make popular two new 1916 models—a four-cylinder car at \$985 and a six-cylinder car at \$1550.

The unit power plant of the "4-38" is carried on three points. The motor is a T head type, with the cylinders cast en bloc and it is water cooled. The cylinders have a bore of $3\frac{7}{8}$ inches and a stroke of five inches, a stroke-bore ratio of 129, which has an S. A. E. rating of 24 horsepower and a brake test of 38 horsepower developed.

For the size of the cylinders the valve ports are unusually large, having an outside diameter of $2\frac{3}{16}$ and a port opening of two inches. All valves are interchangeable and are made with cast iron heads electrically welded on nickel steel stems. These are operated by adjustable tappets, which are case hardened and accurately ground to size.

A feature designed to improve carburetion is the passing of the intake manifold through the cylinder block so that it is completely jacketed in hot water. The automatic float feed type carburetor is located on the right side. The motor is fitted with a centrifugal water pump located in front of the gear case, this allowing the making of a direct connec-

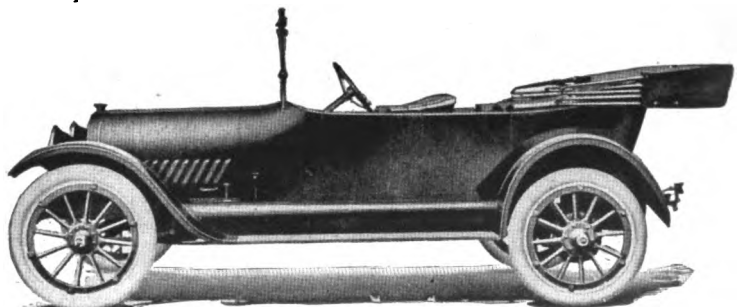
tion from the radiator to the cylinder block.

The motor is short for its piston displacement, which is 220.9 cubic inches. It has a three-bearing crankshaft. The camshaft also is mounted on three large bearings. The piston rings are $3/16$ inches in width and are ground on both sides.

The splash lubricating system includes two overflow basins, located in the lower part of the crank case. There is an oil pocket cast integrally with the crank case directly over each main bearing which is at all times filled with lubricant to insure perfect crankshaft lubrication. The oil supply is replenished through a breather pipe at the front end of the motor at the rear of the gear housing, and incorporated in the breather pipe is the float oil indicator, which shows the level of the oil in the crank case.

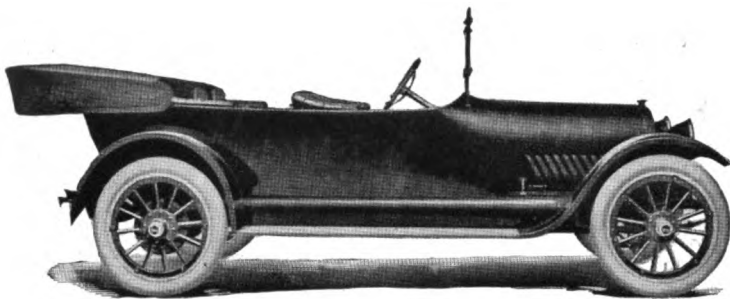
Timing Gears Cut Spiral.

The timing gears are cut spirally. Both the shaft and the crank shaft gears are drop forged,



Auburn Model 4-38, Four-Cylinder, Priced at \$985.

while the camshaft gears are cast iron. This operation of steel against iron and the spiral teeth insures long life and quiet running.



Auburn Model Six-40-A, with Two and Seven-Passenger Capacity.

The lighting generator is driven off the pump shaft and the separate starting motor is installed behind the flywheel housing. The pinion of the motor shaft engages a hardened ring gear on the rim of the flywheel.

The clutch and driving system gearset, with three forward speed ratios and reverse, are mounted in a unit with the engine and the drive is through a propeller shaft with universal joint to a floating rear axle. The front axle is a drop forged I beam section.

The frame is a steel channel section, well braced and hot riveted, inswept and cambered at the rear. It is suspended on semi-elliptic springs forward and cantilever rear springs. The springs are floating on the rear axle, pivoted to the frame at the centre and linked in front, this insuring perfectly free play and extremely easy riding.

The steering column is mounted on the left side and it is a non-reversible worm and gear type. The gear shifting and emergency brake levers are in the centre. The service brake pedal actuated contracting bands on the external face of rear wheel

drums and the emergency brake shoes expand against the interior surfaces of the same drums.

The wheelbase of the car is 114 inches, the tread 56 inches and road clearance is 10½ inches.

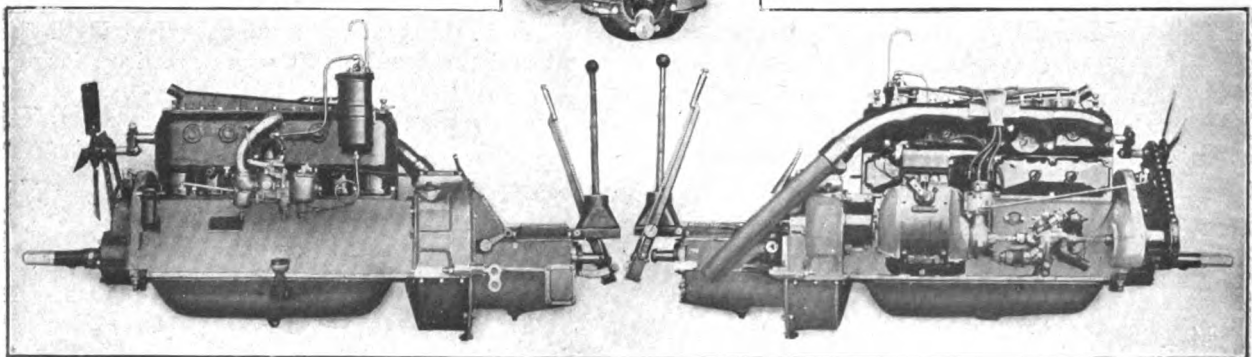
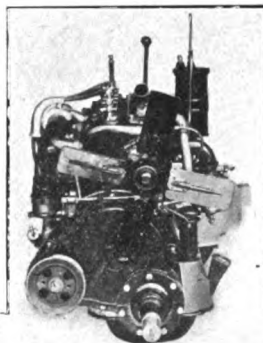
Exceptionally ample space for five passengers is afforded by the touring car body. There are four full "U" doors with invisible hinges. The latch handles are flush with the inside of the door. The tonneau is equipped with collapsible foot and robe rails. In the three-passenger roadster body there is a large deck at the rear, the cover of which is fitted with a lock, and underneath is considerable space that can be used for storage.

The Six-Cylinder Car.

The model "6-40A" is substantially a continuation of the smaller of the two six-cylinder chassis produced by the Auburn company the past season. It has cylinder bore of 3½ inches and stroke of five inches, this giving an S. A. E. horsepower rating of 29.40, but the engine has developed much more power in brake tests.

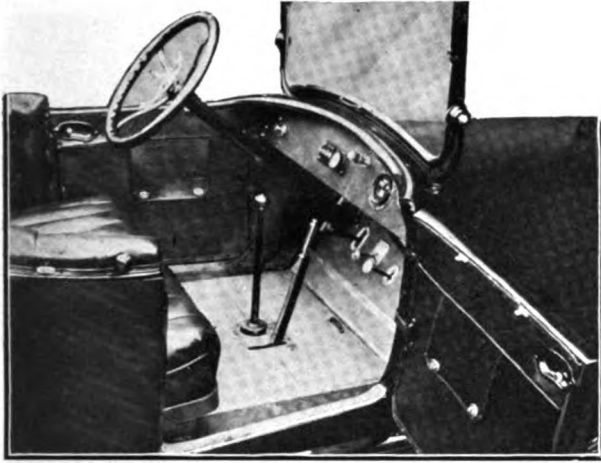
The crankcase and the oil pan are separate, the latter being an aluminum casting. The bearings are carried in the crankcase and are easily accessible. The valves are enclosed and are all on the left side of the L head cylinder block and are operated by a single camshaft. The valves are nickel steel heads electrically welded to carbon steel stems and are interchangeable.

The pistons have three rings and oil grooves have been turned in the side to thoroughly distribute the oil between the pistons and the cylinder walls. The connecting rods are I beam construction. The connecting rod caps are held in place by



Auburn Six-40-A Engine, an L Head Unit Power Plant Mounted on Three-Point Suspension, with Cylinders of Regenerative Air-Furnace Iron.

nickel steel bolts secured by a locking device. The camshaft is drop forged from a single piece of low carbon steel, the cams being in-



Driver's Compartment, Auburn Six-40-A, Showing Pockets in Doors and Instrument Board.

tegral with the shaft. This shaft runs in long, white bronze bearings.

The crankshaft is a three-bearing type. All the timing gears are helically cut and are practically noiseless at all speeds. The design of the exhaust manifold is such as to allow adjustment of valves and valve springs without necessitating its removal.

The Auxiliary Systems.

Water circulation is forced by a gear driven centrifugal pump and air is drawn through the honeycomb radiator by a belt driven fan. The lubrication is by a combination forced feed and splash system. A horizontal plunger pump, driven by an eccentric from the camshaft, forces oil through copper tube direct to the timing gears and over the main bearings. It then drains back into the oil pan, maintaining a level for the splash lubrication of pistons, the cylinders, cams, tappets, the connecting rod and camshaft bearings.

The carburetor is an automatic float feed type. The ignition, starting and lighting current are supplied by a generator and storage battery.

The clutch is a leather faced cone and the transmission gearset is a selective sliding gear type with three forward speed ratios and reverse, with direct drive on high gear. The propeller shaft, from the gearset to rear axle, is fitted with two universal joints. Torsional strain is avoided by the use of double tube torque arms, the forward ends of which are spring mounted.

The frame is a pressed steel channel section, similar to that used in the four-cylinder model,

well braced, hot riveted, inswept at the rear and suspended on semi-elliptic springs forward and cantilever springs behind. The springs are generous in size and applied in a horizontal position.

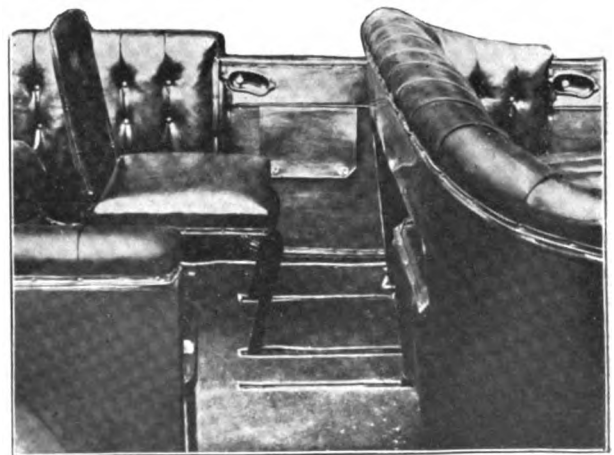
The left drive and centre control is similar in all respects to that of the four-cylinder car and the braking system is practically the same.

The wheelbase is 126 inches, the tread 56 inches and the ground clearance 10½ inches. The wheels are equipped with 34 by four tires. The touring car has ample room to seat seven passengers comfortably. The four "U" doors are flush, have invisible hinges and flush latch handles. Two auxiliary seats in the tonneau are comfortably and amply large, easily operated and fold into the back of the front seat when not in use.

The roadster body is similar, except in size, to that furnished on the four-cylinder chassis.

ELECTRIC VEHICLE CONVENTION.

Plans for the annual convention of the Electric Vehicle Association of America, which will be held at the Hotel Statler, in Cleveland, Oct. 18 and 19, are practically complete. There will be a concentrated programme of two days devoted almost exclusively to business subjects, with a minimum of entertainment. T. P. Cagwin of the Cleveland Telephone Company is chairman of the publicity committee and George H. Jones of the Commonwealth Edison Company of Chicago is chairman of the papers committee. Subjects bearing on the most important questions before the industry have been tentatively selected, and as soon as acceptances are received from those who are invited to speak the subjects will be made public.



Seating Arrangement in Tonneau of Auburn Six-40-A, Showing Auxiliary Seat.

GOODYEAR'S GOAT.

The Goodyear Tire and Rubber Company's district manager who leads in the amount of business done for any one month is rewarded with the guardianship of the Goodyear goat. It is a sure-enough ruminant mammal, with whiskers, horns and fragrance, and answers to the name of "Violet," although that title is not in keeping with either his sex or odor. "Sweet William" has been suggested as a name more appropriate to the kind of a goat he is.

Just now "Violet" is ruminating upon his fate and the office equipment of Goodyear's Philadelphia branch, that office having the distinction of leading in business done last month. It is related that the manager was horrified to receive a tele-



"Violet," the Goodyear Goat.

gram appointing him as "Violet's" guardian, but has become reconciled. The goat's feelings have not been described.

Goodyear men are not averse to having one of their own number "get their goat," but maintain that they will see that no competitor gets it.

ANCHORED "AUTO" FOR NEW DRIVERS.

A method of teaching a beginner to drive has been worked out by the Bishop, McCormick & Bishop Company of Brooklyn, N. Y., distributors for Cole cars, which is said to be a great improvement over anything that has been tried before.

In this case the president of a large Brooklyn corporation wished to purchase a car for his wife, but she feared that she could never learn to drive. To overcome that obstacle the salesman had a

car raised just far enough off the salesroom floor so that the tires would not touch.

He then placed the pupil in the driving seat and gave her a thorough lesson in manipulating levers and pedals with the motor running just as though the car were on the road. The reflection of the car in a large plate glass window made it possible for the pupil to see the effect on the spinning wheels of each adjustment made in the gears, throttle, accelerator and other control devices. The lesson was repeated four times.

Then the car was taken on the road and the beginner drove it with great confidence. In four lessons in the shop as much had been accomplished in teaching good driving as is often learned in six months' road experience. The car was sold at once.

RESTA DRIVES PREMIER SPEEDSTER.

Dario Resta, leading racing driver of the year by virtue of his victories in the Vanderbilt, Grand Prix and Chicago Speedway events, has purchased a Premier speedster and he and his wife are spending most of their time between races on the roads of the middle west in this car. Resta is said to have given his check for \$1985 for the car. He is very proud of it and declares it is the only American made machine he would care to drive. He will take it back to England with him after the racing season.

GOODRICH CLAIMS \$25,000,000 SAVING.

The B. F. Goodrich Rubber Company claims credit for saving \$25,000,000 to tire users of the country, as a result of the price cuts announced in its "fair list," most of which have been followed by other makers of tires. This announcement made an average cut in tire prices of \$3.50 per tire and on a basis of 1,623,555 cars, each requiring four new tires a year, the saving would reach \$5,000,000.

TWO S. A. E. MEN FOR NAVY BOARD.

Secretary of the Navy Daniels has asked the Society of Automobile Engineers to designate two men to serve on the navy advisory board, of which Thomas A. Edison will be chairman. The council of the society has the matter of the selection before it and has asked for suggestions from the governing committees of the society sections.

DIXIE HIGH TENSION 12 MAGNETO.

THE Splitdorf Electrical Company, 98 Warren street, Newark, N. J., is now building the Dixie magneto for 12-cylinder engines, two views of which are shown. A special quality of this instrument is the simplicity of design, the number of parts being minimum and complications correspondingly reduced. It is a high-tension type.

The distributor is no larger than those used for four-cylinder motors. One will note, however, that there are two rows of six contacts. Each row of contact points is wiped by a separate brush. Each contacting brush is connected with an auxiliary brush so arranged that the high-tension current is first transmitted to one travelling brush and then to the other. This communication is alternate and at no time do both brushes receive the current simultaneously.

The positions of the two travelling brushes are of unusual interest. Each is set in a separate arm or extremity, which are joined and are actuated by a common shaft. The two rotating brushes carry the same polarity of current and as like poles repel instead of attract, the current cannot jump from one brush to the other.

The breaker of the instrument is unusual in construction. The breaker arm is operated by a four-point cam, which is driven at $1\frac{1}{2}$ times the engine speed. Four sparks must occur during each revolution of the cam, which is geared to the distributor arm at a ratio of three to one. Special care has been taken in the construction of the breaker arms to obtain balance and by an ingenious arrangement of the various parts, the hammer blow of the platinum points has been eliminated. The breaker arm bearing and cam are self-lubricating.

Practically any spark control can be had, provision being made for a wide range of advancement or retard. This quality is especially desirable on high-speed engines.

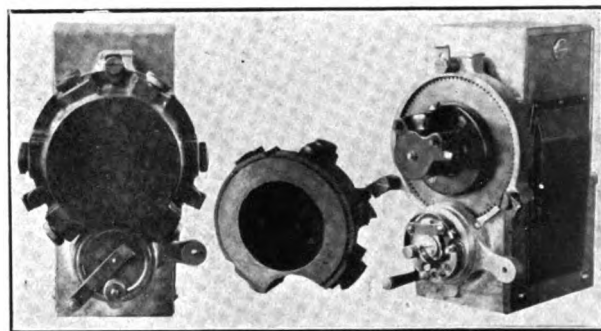
Provision is made for installing an ordinary switch connected to the terminal attached to the lid of the breaker box. The interior mechanism is enclosed in an oil and water proof casing and as a unit has a very neat appearance. Statement is made that this type of magneto has been subjected to exhaustive tests and has proven its efficiency to the satisfaction of its users.

An outstanding characteristic of the Dixie 12 magneto is that it has no rotating wire wound armature, and statement is made that the instrument may be operated indefinitely at 1500 revolutions

a minute without damage. At this speed the maker claims that 20,000 sparks are produced in perfect synchronism, which is stated to be a record for synchronous spark production which has never been equaled even by battery timers.

PETROLEUM FOUND IN PHILIPPINES.

Following the discovery of asphalt in Leyte, near the head of the Buatson river, in the Philippine Islands, it has been found that petroleum exists there in considerable quantities. The rock strata in which this oil is found are identical with those present in the fields where petroleum was found at Tabayas, and a scientific examination has led to the conclusion that it is a detached portion of the same field. The oil in both fields is very light, with a high percentage of gasoline.



Splitdorf's Dixie Magneto for 12-Cylinder Motors.

More exploration work is necessary, however, before it can be known whether petroleum exists in sufficient quantity and under the right conditions to justify drilling for it.

NEW MOTOR DEVELOPMENT.

Thomas A. Jensen, an employee of one of the largest motor manufacturing companies in Detroit—the Continental Motor Manufacturing Company—has perfected a new motor design after almost two years, and is about to place it on the market. The camshaft and front gear are said to be done away with, the motor working entirely through the cylinders' main shaft and piston. He did the work at his home, 264 Coplin avenue, Detroit.

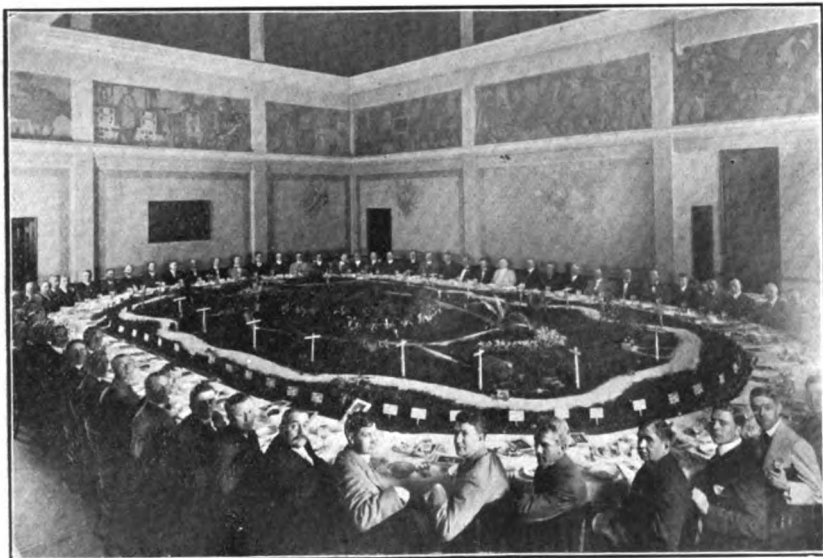
In the period from August, 1910, to July, 1915, automobilists paid \$63,198.76 into the treasury of New York State as fines.

INDUSTRIAL HAPPENINGS AND COMMENT.

THE Studebaker Corporation recently gave an elaborate banquet in the South Bend administration office to the branch house managers and the dealers of the larger cities. It came as the climax of a three days' business conference, during which the business strategy for the next year's campaign was thoroughly threshed out. The table was a great oval and had 70 plates, which were arranged around a miniature pastoral scene along the Lincoln highway. Close scrutiny of the accompanying illustration will reveal miniature automobiles, presumably Studebakers, speeding along the transcontinental route.

The International Rubber Company, Denver, Col., has been organized to manufacture and market a new kind of tire tread and also automobile tires and accessories. The company has a capital stock of \$50,000, all subscribed, and will employ about 100 people at the beginning.

H. L. Buller, who was with the publicity department of the Oakland Motor Car Company for two years, is now connected with Apperson Brothers' Automobile Company.



Studebaker's Branch House Managers and Dealers Seated at the Banquet Table.

Kokomo, Ind., in charge of advertising under the direction of J. H. Newmark.

Fuller & Sons Manufacturing Company, Kalamazoo, Mich., builder of automobile parts, is experiencing a decided increase in its business and finds it necessary to add to its present plant by additions that will give more than double the present capacity. New machine tools for the manufacture of transmissions and valued at several thousands of dollars have been ordered and will be installed as soon as delivered.

John Porter, formerly with the American Voiturette Company and the Regal Motor Car Company, in Detroit, is at the head of the Regal Motor Sales Company, which was formed at Boston to succeed the C. R. Robinson Company, distributors in the past of Regal cars in New England. C. H. Briggs, who was with the Robinson company, remains as treasurer of the new company.

The Burd High Compression Ring Company, Rockford, Ill., maker of the guarded opening piston ring, has published a very comprehensive and valuable 136-page directory of piston ring sizes for automobiles, motorcycles, trucks, cycle cars, tractors and engines. The directory includes every model for all years of all kinds of vehicles using gas engines, giving the exact size of the rings employed and the number to each cylinder. It will be found to be a very valuable compendium for owner, repair man or dealer. The price is 50 cents, and it can be

obtained from the Burd company.

L. B. Saunders, formerly connected with the Lion Motor Car Company, Adrian, Mich., and later with the Abbott Motor Car Company, has taken over the branch of the Oakland Motor Car Company of Boston.

The International Motor Company, Plainfield, N. J., has announced that it will grant a substantial increase in the wages of all its employees. It is understood that the reasons are because of the great increase of profits on trucks and partly to forestall possible participation in the demand for higher wages that is now being reported from various parts of the country. The company has been working day and night for the past half year to fill war orders for trucks. The Saurer truck is the chief product of the Plainfield plant.

John J. Luck, San Antonio, Tex., has invented and patented a pneumatic "puncture proof" tire, which is to be manufactured by a company that is being organized there. Capital is stated as being \$10,000 preferred stock, bearing 10 per cent. cumulative dividends. The Luck tires were run for 12,000 miles without a puncture in a recent test.

The Falcon Motor Truck Company, Detroit, has been organized with \$20,000 capital stock to manufacture the Falcon half-ton delivery wagon, listing at \$750. O. B. Malloy, president and treasurer; F. B. Houston, vice president, and A. B. Hazard, secretary and general manager, are the officers of the company.

The Hercules Motor Car Company's plant, New Albany, Ind., will be sold at auction Aug. 14. The sale is to satisfy a \$20,658.75 judgment. The company has a total of \$110,000 in judgments against it.

The Texas Oil Company, New York City, has selected a site on Long Island for the erection of a refining plant which will have an estimated cost of \$100,000.

The Scripps-Booth Company's product will be handled in London and Berkshire, England, in eight territories in Wales and in the Isle of Anglesey, Ireland, by the Briton Motor Company, Ltd., as the sole distributor, with headquarters in London.

The Motor Car Manufacturing Company, Indianapolis, builder of Pathfinder cars, has had plans drawn for an addition to its plant,

the building to measure 60 by 400 feet. This is expected to provide ample room for the contemplated production of 3500 Pathfinder cars in 1916.

The Miller Tire and Rubber Company, Akron, O., is reported as preparing to build a \$50,000 addition to its plant, the new building to be six stories high and 109 by 154 feet. A one-story and basement building, 40 by 57 feet, will also be erected. The total extensions of the company are estimated to reach the sum of \$200,000 for the year.

The Republic Motor Truck Company, Alma, Mich., is to build another addition to its plant, although large extensions were made but a few months ago. The new addition, made necessary by business increase, is composed of two buildings with a combined floor space of 18,500 feet. Further additions are contemplated that give 20,000 square feet more.

Apperson Brothers Automobile Company, Kokomo, Ind., announces that construction work on a new addition to one of its plants is now under way, with bright prospects for early completion. The addition, which will be used for general manufacturing purposes, will contain about 150,000 square feet of floor space. This increase is badly needed, it is said, to give adequate production facilities to meet the demand for the Apperson model for 1916. The company is experiencing the best business year of its history.

SUGGESTIONS FOR THE FORD CAR OWNERS.

Principles of Electricity That Apply to the Construction of the Ignition System—the Advantages and Limitations of the Flywheel Magneto—Uses for Batteries.

The 29th article dealing with the construction, operation, maintenance, care and repair of the model T Ford chassis is devoted to the consideration of the general principles of electricity as applied to the system by which current for ignition and incidental lighting is generated.

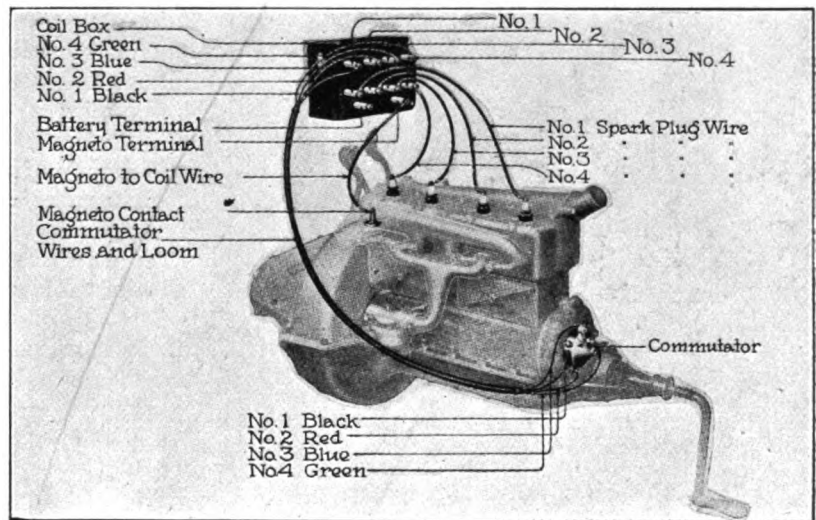
ELECTRICAL current is necessary for ignition of the fuel gas in the cylinders of the power plant, and this is created by an alternating current dynamo of peculiar design and construction that is usually referred to as the magneto. This dynamo differs from other machines used for a similar purpose, and while its service is decidedly satisfactory, its function is necessarily limited. By this is meant that the conventional dynamo may be utilized as a generator or a motor—that is, as a generator to convert mechanical power into electrical current, or as a motor to convert electrical current into mechanical power, but the Ford dynamo can only be used to create electrical current, because the current it produces cannot be commutated or rectified and sent in one direction only, and direct current only can be used for charging a battery or accumulator.

That the reader may have a sufficient knowledge to deal with the Ford system of ignition, a recital of certain elemental facts relative to the generation and control of electric energy is necessary. In this magnetism must be associated. The most commonly understood principle of magnetism is that of the marine compass. This is a magnetized needle which, when suspended or balanced, will indicate by its general longitudinal direction the magnetic north and south poles of the earth. Magnetic indications of this character are with the real north pole of the needle pointing south and the south pole pointing north, because poles of like polarity repel and poles of unlike polarity repel.

Magnets may be of two forms, the permanent, which is permanently magnetized, and the electro-magnet, which becomes magnetized during

the period that an electric current is passed through it. Dynamos, either generators or motors, are constructed with electro-magnets, but the magneto generator is built with permanent magnets, this type being the familiar magneto generally used for gas engine ignition current production. When a current of electricity is passed through a bar of hardened steel it will become permanently magnetized, but if a similar current is passed through a bar of soft iron, it will be magnetized only during the passage of the current, although it may retain a small degree of magnetism, which is termed residual magnetism.

The current of magnetism in a magnet flows



The Ford Ignition System as It Is Seen in the Chassis, Showing the Timer, the Coil Box and the Primary and Secondary Wiring.

from the north pole and passes through space to the south pole and in this manner forms a circuit. Thus a circuit is created with every magnet, no matter what the type. Electricity not active is known as static electricity, and when electricity is in motion it is known as dynamic electricity. What is referred to as a current is dynamic electricity. This form of electricity may be produced by what is known as a primary cell, through the galvanic action of acid upon metal, for instance, or by induction.

The flow of magnetism between two poles is known as the lines of force, and this influence

can be very accurately determined. An electric current will produce all the characteristics of a magnet. A wire carrying an electric current is surrounded by magnetism, and the flow of this magnetism or lines of force will vary with the direction of the flow of current. The tendency of these lines of force is to arrange themselves parallel to each other, and if a wire or conductor forming a closed loop or circuit is moved parallel to the direction of the lines, so that no lines are cut or interrupted, no current will flow in to the conductor, but if the wire or conductor is rotated so that the lines of force are cut by it, and so that the number of lines passing through the conductor are constantly changing, either decreasing or increasing, then a current will be induced. When a conductor is moved near and across the north pole of a magnet, electromotive force will be generated, in impulses which will be propor-

power is not generated by the brushes in frictional contact with the commutator. The wires of the armature that form the conductors are carried in the channels of the armature core and are connected to the commutator. As the conductors of the armature are revolved between the magnets (which are magnetized by electricity), a voltage or current is established and current will flow from the positive brush through the outside circuit to the negative brush, thence into the commutator and through the wiring of the armature to the positive brush. The value of the voltage depends upon the speed of the armature and the strength of the magnets. If the conductor is moved twice as quickly across a magnet, or the surface of the magnet is doubled in area, the voltage is proportionately increased.

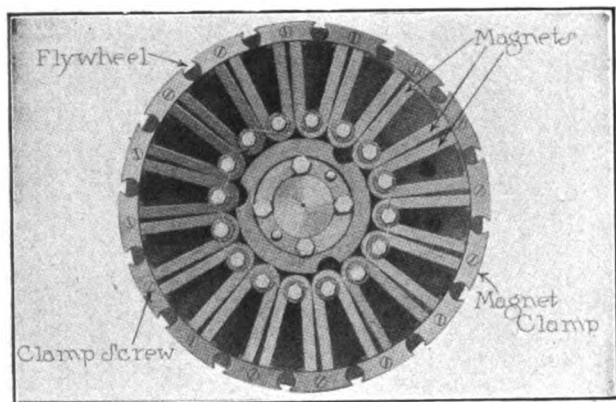
Limits of the Ford Magneto.

What has been stated relates to the principle of the dynamo or generator. The relation between magnetism and electricity is unknown, but the creation of current is certain, and it can be regulated and controlled to obtain the most accurate results. The source of current in a Ford power plant is a magneto in the sense that permanent magnets are used, but the current cannot be commutated or changed to direct from alternating and for that reason its use is limited to the service made of it.

The magneto differs from the conventional types in that the permanent magnets revolve within a series of coils, instead of coils revolving within a series of two or three magnets, and the generating power is dependent upon the number of revolutions of the engine. In the design of the magneto 16 permanent magnets are arranged at regular intervals, with the vertex or tops of the V-shaped magnet close to the axis of the flywheel, to which they are clamped, and with the legs of the magnets clamped to the edge of the flywheel. Thus there are 16 bolts holding the heads of the magnets, and 16 clamping plates holding the legs, these plates being slightly separated. This construction gives 16 north poles and 16 south poles instead of the single north and south poles of the other forms. The studs or bolts that retain the tops of the magnets are connected by wiring.

Has 16 Separate Coils.

The coils are 16 in number, these being constructed of flat copper wire or ribbon, and are each connected, there being a single lead or connection for the assembly. One end of the ribbon is grounded. These coils are arranged in a circle on a metal plate that is secured to the inside of the flywheel housing, the plate having a cir-



The General Construction of the Combined Flywheel and Rotating Magnet Carrier of the System.

tional to the number of movements a second, the strength of the magnetic field and the length of the conductor.

Principles of Dynamo Construction.

In the construction of a dynamo the north and south poles are placed opposite, so that there will be a free path for the magnetic lines of force from the north to the south pole. A conductor is rotated between the two poles, this conductor being a loop of wire, and the movement of the conductor produces a whirl of magnetism at the north pole that is in the opposite direction to that caused by the conductor passing the south pole. Thus in practice in a dynamo two currents are produced, each flowing in a different direction. This form of current is always produced in a mechanical generator, but it may be rectified or changed to a pulse-like in one direction by rectification or commutation.

With a generator or dynamo the electric

cular opening in the centre, so that there is ample clearance for the flywheel flange on the engine crankshaft. The coils are thoroughly insulated by being impregnated with a material forced through the insulating fabric by a vacuum pressure and by baking. The coil housing is so constructed that when the flywheel and the transmission gearset assembly is installed, there is a slight clearance between the magnets and the coils. There is but a single lead from the coils to the switch, this being from a contact in the top of the flywheel housing that consists of an insulated connection to which is attached a contact spring and a metal block. Outside of the case is a knurled thumb nut to which the cable that leads to the switch is secured. The other side or part of the circuit is through the flywheel, and the metal construction of the engine case to the timer or commutator that is located ahead of the first cylinder. As the metal block of the contact is stationary, there is no probability of wear, but there is possibility of foreign substances becoming lodged between the contact spring, which condition might reduce the efficiency of the current.

Designed for Ignition Alone.

The magneto was designed to create current for ignition purposes and the company building the machines discourages the use of the system for any other purpose, for there are many who utilize the current for a circuit for lighting the head lamps. The design of the engine is such that the lower part of the flywheel is revolved in cylinder oil—in fact, the flywheel is the means of distributing the lubricant, but this condition has no effect upon the efficiency of the system.

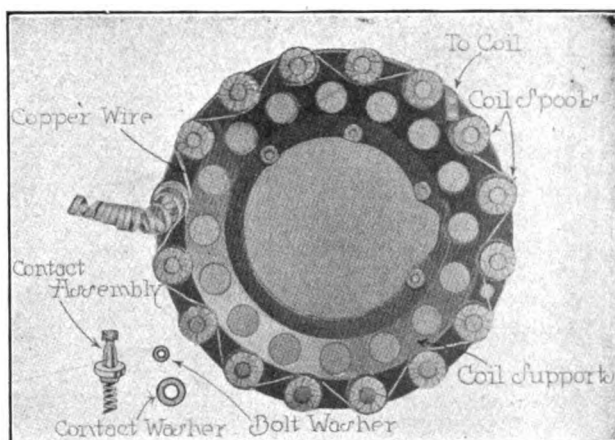
The magneto will create current in ratio to the number of revolutions it is driven, and at low speed the current is weak in comparison with what will be generated when it is driven at what may be regarded as maximum speed. This is a characteristic of all magnetos. The current is what is known as low-tension, that is, the voltage is low, and to obtain satisfactory ignition the voltage must be greatly increased. This means that to fire the gas in an engine cylinder the current must be what is known as high-tension, and a low-tension current can be intensified by the use of a transforming coil. This brings us to the consideration of the principles of coils and their construction and uses.

Current Drawn from Space.

The armature of a motor or a generator revolving between the poles of a magnet will create an electric current by cutting or interrupting the lines of force of the magnetic current or flow be-

tween the poles of the magnet if the number of lines is constantly increased and decreased. There is no contact between the armature and the poles, and in the space between them the current is created. The power is transmitted or created in the space between the magnetic poles and the armature, and this condition obtains, no matter what the size of the machine.

There is one important fact in connection with the law governing the attractive or repulsive force of magnetism, and that is that it varies inversely with the square of the distance. If the distance between two magnetic poles is doubled the intensity of the magnetic field is reduced to one-quarter, and if it is tripled the field is reduced to one-ninth, and this ratio obtains with reference to the attraction of poles of the unlike polarity. Where this fact is particularly important will be emphasized later on.



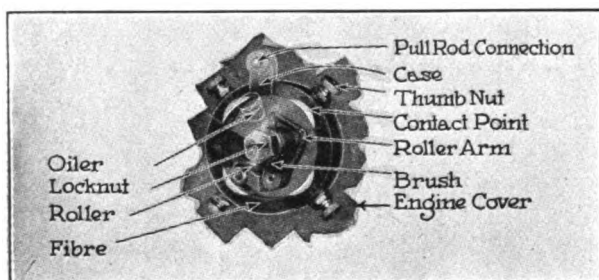
The Arrangement of the Field Coils of the Magneto on a Stationary Plate, Near Which the Flywheel Revolves.

As batteries of so-called dry cells and wet cells and magnetos and generators are used for ignition purposes, the reader's attention may be directed toward some of the characteristics of batteries. The dry cell is usually a container of zinc which is lined, both sides and bottom, with heavy absorbent paper saturated with a solution of sal ammoniac. The central electrode is a stick of carbon carrying a terminal that extends nearly to the bottom and rests upon a small block of absorbent paper. The space in the cell is packed with a combination of pulverized coke and dioxide of manganese. The other terminal is soldered to the edge of the zinc can. The top of the cell is covered with a sealing compound of pitch or asphalt.

The sal ammoniac solution attacks the zinc, creating hydrogen gas, which has a great affinity for oxygen, and the dioxide of manganese, which

contains much oxygen, absorbs much of the hydrogen. This combination of dioxide of manganese and coke is known as the depolarizer, and it is intended to prevent the hydrogen accumulating on the carbon pole in sufficient volume to insulate it and weaken and reduce the electric current. When used continuously a dry cell will polarize and when this has been reduced by a period of inactivity the cell will seemingly recuperate and gain in strength, because of depolarization.

A dry cell is really a damp cell, sealed to prevent evaporation of the solution, and intended for open circuit or intermittent work. All dry cells are constructed with the view of the zinc being practically destroyed by the solution, so that when the zinc is nearly consumed the solution will have served its usefulness. The dry cell is comparatively cheap and can be used a considerable period for the work intended, but it will heat and will rapidly deteriorate with a continuous or a heavy load. As the potency of the element



The Timer, the Instrument That Controls the Firing of the Cylinders, Showing Some Components.

lessens the value of the potential or current decreases. These cells produce direct current, the circuit being into the negative pole and out of the positive pole of the cell.

Storage or Secondary Batteries.

The wet or storage battery cell differs from the primary cell just described in that it is a secondary cell, and whether it be a lead-acid or a nickel-iron-alkaline type, it must be charged by a direct current. The reason for the necessity of a direct current is that there must be an impressed voltage so that there can be a current flow that will be of sufficient endurance to serve a useful purpose. An alternating current cannot impress the voltage because of the constant reversal of the current flow. By charging mechanical energy is accumulated or changed into chemical energy, and chemical energy is in turn transformed into electrical energy, with some loss, by discharging. But this process can be continued for a much longer period with the

nickel-iron-alkaline cell than with the lead-acid, and there is not the exhaustion and deterioration that is characteristic of the dry cell.

Some Primary Principles.

The positive plates of the lead-acid cell are peroxide of lead and the negative plates spongy lead when the cell is fully charged. As the cell is discharged the plates become sulphated, the surfaces being transformed to what is known as lead sulphate, in which the lead is combined with the sulphuric acid radical from the water and sulphuric acid electrolyte. This is reduced and the plates restored to peroxide of lead and spongy lead respectively by the next charge. The positive plates of the nickel-iron-alkaline cell are nickel hydrate and nickel, and the negative plates are iron-oxide. The electrolyte is a solution of caustic potash or potassium hydroxide. In charging the nickel hydrate is transformed to a higher oxide and the iron oxide is reduced to metallic iron. In discharging the metallic iron becomes iron oxide and the super oxide of nickel is changed to a nickel oxide.

The changes that take place in either type of cell during charging it, broadly spoken of as action, and during discharging as reaction, both of these resultant of the electrolysis or electrolytic effect of the electric current upon the solutions in the cells. In effect charging creates a pressure in the cells so that there will be, on discharge, a flow of current that may be likened to that of water seeking to find a level, the pressure varying with the type of cell and its condition.

Low Voltage of Cells.

The voltage rating of the average dry cell is two, of the average lead-acid cell two, and of the nickel-iron-alkaline cell 1.2, while the amperage rating will vary decidedly. The voltage ratings stated are what may be termed accepted values, by which a battery of five dry cells would be rated at approximately 10 volts (if new cells), a battery of three lead-acid cells would be rated at six volts, and a battery of five nickel-iron alkaline cells at six volts.

(To Be Continued.)

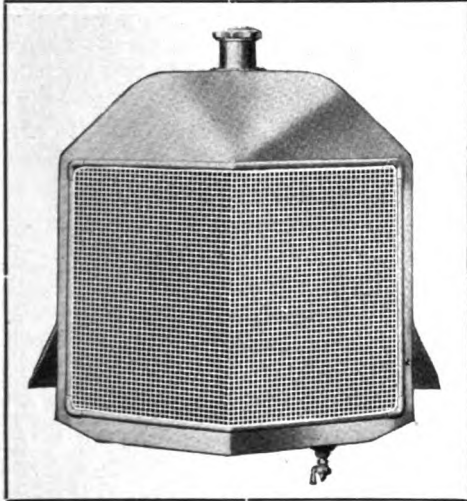
The Massachusetts highway commission has been holding hearings to determine the recommendation it will make to the legislature in answer to a resolution passed at the last session asking for advice on a proposed regulation as to the brilliancy of headlights used on automobiles. Dealers, officers of clubs and others interested are being given an opportunity to appear before the commission.

FORD CAR ACCESSORIES AND EQUIPMENT

V FRONT RADIATORS FOR FORDS.

Radiator Which Adds to the Appearance of the Ford Car and Affords an Efficient Cooling System.

The Rome-Turney Radiator Company, Rome, N. Y., manufacturer of several types of radiators, is marketing the extended V front radiator for Ford cars shown in the



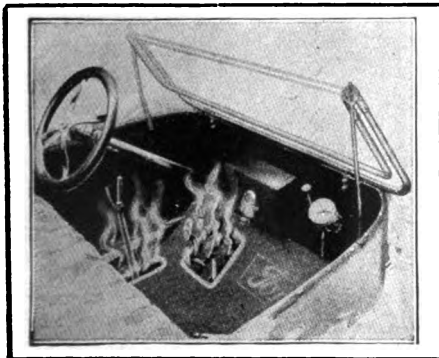
Rome-Turney Radiator for Ford Cars.

accompanying illustration. This type greatly increases the water capacity and maintains the Ford motor at a normal temperature and will greatly improve the appearance of the car. It also reduces the gasoline and oil consumption by affording an efficient cooling system. It is obvious that a radiator of this type fitted to a second hand car would increase its value in a sale. Difficulty in cranking is eliminated by the extended starting crank, which is furnished without extra charge. This company also has a department entirely devoted to the making of radiators which replace worn or damaged members for all makes of cars. Complete information will be furnished by the company.

CAR COOL.

Device for Preventing Heat from the Ford Motor from Entering the Driver's Compartment.

As every motorist knows, the front compartment of some cars becomes unbearably hot from the heat that escapes through the pedal slots into the compartment

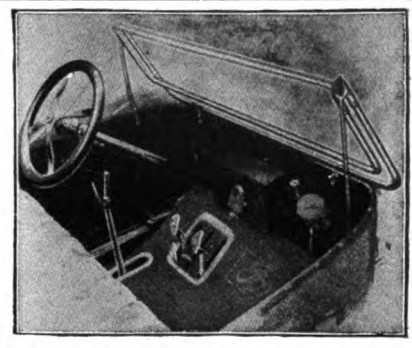


Showing How Heat Enters Driver's Compartment Through Apertures.

from the motor. This is due partly to the fact that the fan drives the heat in waves back through the apertures. To overcome this the logical thing to do is to close the apertures. This is what the Car Cool Company, 1130 Old Colony building, Chicago, has done with its car cooling device, signifi-

cantly known as Car Cool, and designed especially for attachment to the Ford car.

The attachment fits to the underside of the floor board and not only closes the pedal slots, irrespective of the positions of the levers, but insulates the entire floor. When in position it does not interfere in any way with the operation of the pedals. Its installation is simplicity itself, and even a boy can install it within 20 minutes with a minimum of labor. The complete equipment retails at \$3. Further particulars will be supplied by the company to those who mention this publication when writing.



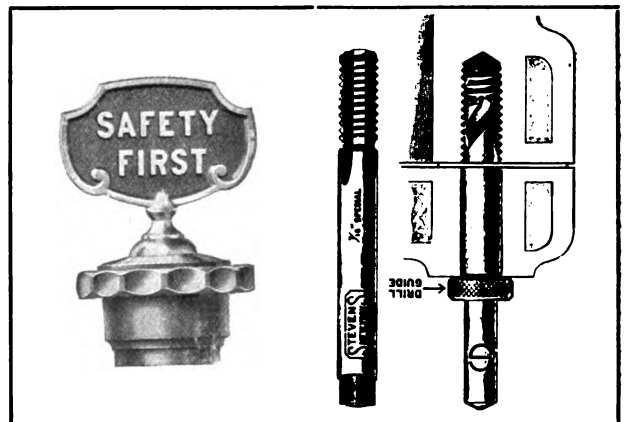
Attachment of Car Cool Keeps the Compartment Cool.

STEVENS SPECIALTIES.

Equipment for Removing Sheared Off Bolts and for Reserving an Emergency Fuel Supply.

The removal of cylinder head and water connection bolts which have been sheared off is a difficult operation. If extraordinary care is not taken, the threads of the cylinder head are liable to become damaged. To guard against this the Stevens & Co., 375 Broadway, New York City, is manufacturing the No. 100 cylinder tap and drill set for Ford cars, shown in the accompanying illustration. A special bushing fits over the drill and centres it so that all but a small portion of threads of the bolt are removed. A special tap easily cuts these away, the result being the original perfect hole. The equipment is fully guaranteed.

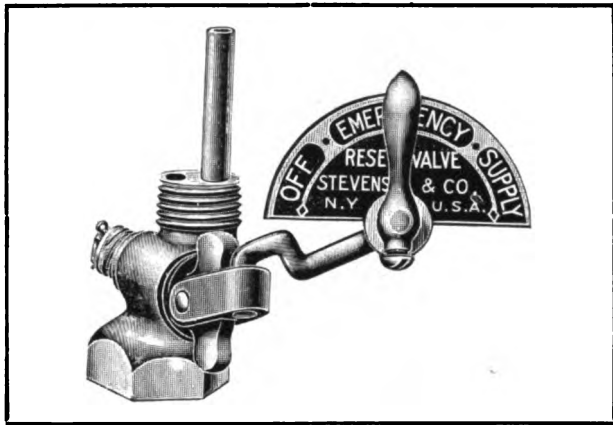
Another specialty made by this company for the Ford car is a reserve and shut off fuel valve, which attaches between the gasoline tank and the sediment bulb. The purpose of this attachment is to reserve one gallon of gasoline in the tank, by turning the valve in the emer-



Stevens Radiator Emblem and Cylinder Tap and Drill.

gency position. The valve may be turned in three positions, supply, emergency and off, the handle on the dial controlling the positions. The dial is placed on the heel

board under the front seat, from where the supply may be fully shut off without the customary stooping under the car. The valve is guaranteed to be absolutely leak proof and retails complete for \$1.



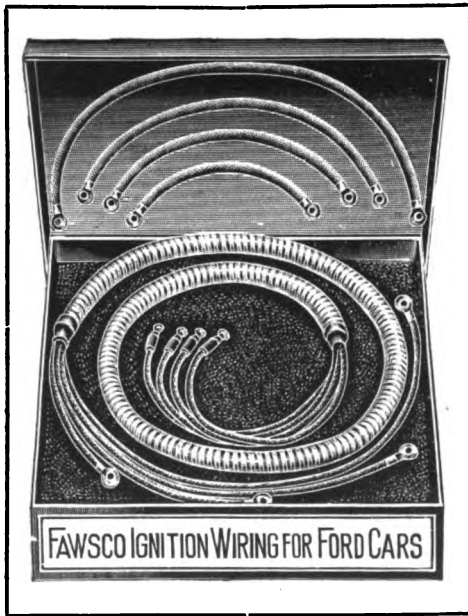
Stevens Reserve and Shut Off Fuel Valve.

The Stevens company is also marketing the Safety First radiator emblem, as shown. It attaches to any standard car, including the Ford. The words "Safety First" are painted in white enamel on a green back ground, the official colors of the Safety First Society, and it always acts as a caution to pedestrians and drivers of other vehicles.

FAWSCO IGNITION WIRING.

Metal Armored Ignition Wire Assembly for Ford Cars Which Is Not Affected by Heat, Water or Oil.

The Fawasco Ignition wiring, illustrated herewith, and manufactured by the J. H. Faw Company, Inc., 41 Warren street, New York City, is designed to meet all the



requirements of the Ford ignition system. The set may be obtained with or without the secondary wires. As can be seen in the accompanying illustration, the primary wires are enclosed in a flexible metal tubing, which affords a protector that prevents the wires from being affected by heat, oil or water. The separate wires are easily differentiated, as each cable is finished in a different color. Long service is absolutely assured, as all joints are soldered and the timer terminals prevented from short circuiting by black insulating tips. High-grade ignition cable is used throughout. The complete set retails at \$1, and is shipped in a display case carton.

THE REGULITE.

Instrument Which Automatically Prevents a Voltage Too High for the Lamp Capacity.

It is evident that as the speed of the Ford magneto increases, a current of large voltage results. It often rises above what the lights are designed to receive, the result being that they burn out. To prevent this the Fulton-McCutchan Company, 1514 Michigan boulevard, Chicago, is marketing the Regulite illustrated herewith. This instrument is a combination of switch and controller, which automatically impedes the current running to the lights and prevents it from rising to a voltage higher than that of the lights. It is obvious that by depriving the lights of this excess, sufficient current is



Fulton-McCutchan Regulite.

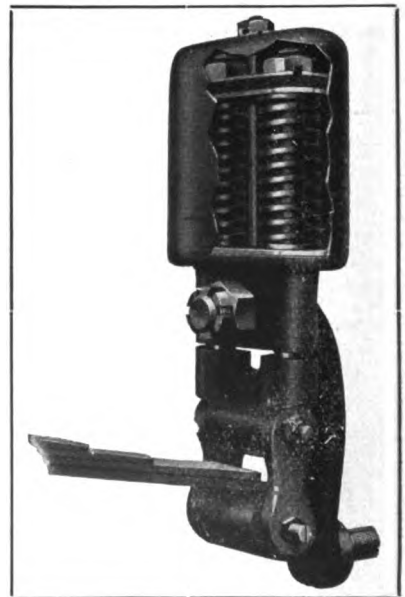
always insured for ignition purposes. The Regulite is provided with three steps, or degrees of action, so that it may be applicable to generators of varying capacities. The retail price, complete with switch, is \$2.50.

VELVET SHOCK ABSORBERS.

High Quality Shock Absorbers for Ford Cars Being Sold at Popular Prices.

Among the distinctive features of the Velvet shock absorbers, made by the John W. Blackledge Manufac-

turing Company, 2110 South Michigan avenue, Chicago, is the method of fastening the covers to prevent rattling and loss, and the self-lubricating extended sliding block. In addition to these is the arrangement of multiple coil springs, which vibrate much faster and ride much easier than if one stiff member were employed. The absorber is constructed to adjust itself automatically to any load, irrespective of road conditions. The design for Ford cars is retailed in sets of four for \$15. A special inducement to the trade at this time is that the Blackledge company is offering a trial of 10 days. If found unsatisfactory the absorbers can be returned express collect and the full purchase price will be refunded.

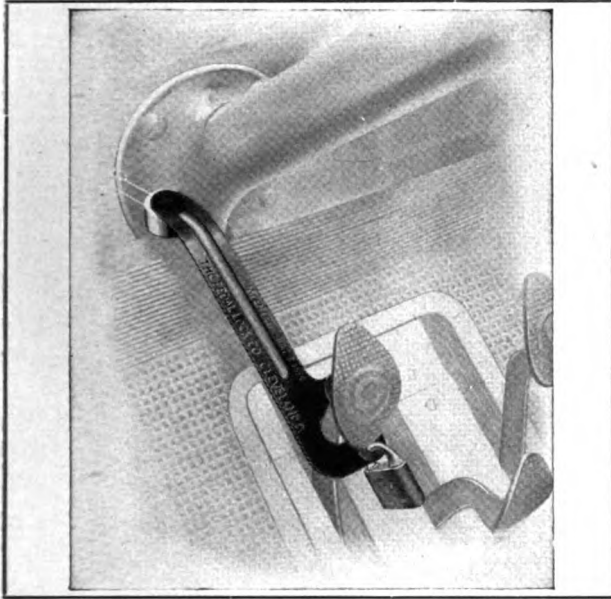


Velvet Shock Absorber as Attached to Ford Car.

PEDAL LOCK.

Device Which Locks the Clutch Pedal of the Model T Ford in Neutral and Prevents Theft of the Car.

The Pedal Lock Company, 1291 W. Sixth street, Cleveland, O., is the manufacturer of the pedal lock for model T Ford cars shown in the accompanying illustration.



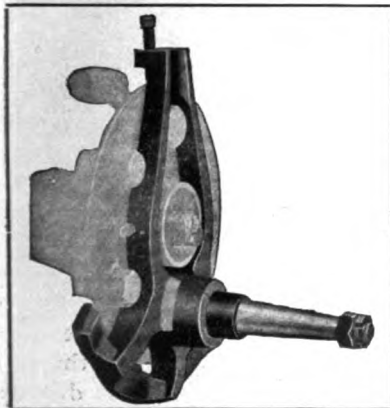
Pedal Lock Holding Ford Car Clutch Pedal in Neutral.

tion. This device is an absolute preventative of theft, because, although the motor may be started, the car cannot be operated in a forward direction while the lock holds the clutch pedal in the neutral position. The shank of the lock is attached to the left hand bolt in the base of the steering column. The pedal is held in a yoke, which is locked by a pad lock. The pedal lock may be obtained at most dealers or is shipped prepaid from the factory for \$1.

TWO EKERN SPECIALTIES.

One Simplifies the Towing of a Ford Car and the Other Simplifies the Handling of the Motor.

The two quality specialties illustrated herewith, the product of Ekerns Brothers, Flandreau, S. D., are designed especially for Ford cars and are highly meritorious.



Ekern Auxiliary Axle Shaft.

One is in nature of an auxiliary axle shaft and is intended to afford means of restoring temporary traction to a Ford car when the rear axle is broken. It hooks under the flange of the rear axle housing, being held secure by a set screw. By forcing the broken axle shaft out of the hub, the wheel can be slipped on to the emergency shaft and traction resumed. It weighs six pounds, and retails for \$5.

The second spe-

cialty is a portable motor stand, which receives the motor from the chassis and holds it by two cap screws, which fit into the point of retention of the water outlet



Ekern Portable Motor Stand on Which Ford Motors Can Be Handled Very Easily.

pipe. The motor can be revolved and locked at any angle, which makes for accessibility to all parts. A tray is provided on the stand for holding tools, etc. The stand complete retails at \$20.

FORD SPECIAL AUTOKIT.

Bay State Autokit No. 3, Which is Designed to Meet All the Requirements of the Ford Car.

George A. Cutter, Taunton, Mass., is the sales agent for the Bay State Autokit No. 3, which is designed to meet all the requirements of the Ford car. As shown by the accompanying illustration, the set consists of a double-ended ratchet wrench, 11 heavy gauge pressed steel sockets, a heavy screw driver and a seven-inch extension steel shank. The sockets are case hardened and nickel plated. This design is such that nuts and bolts fitting close to the wall are very easily gripped. The sockets include a special long member for removing spark plugs, and also one which fits the nuts on the Ford crankshaft bearings. The outfit is neatly arranged in a



Bay State Autokit No. 3 for Ford Cars.

strong, black finished, lock cornered box, which is fitted with heavy brass hinges on the outside. Each piece is made of the best of material and is fully guaranteed. The complete outfit retails at \$4.

MANY USES FOR CONTINENTALS.

Although Continental motors are chiefly known for their use in motor cars and trucks, they are applied also to many other uses. They have been installed in many motor boats, some of which are famous for their speed. A special design is supplied to the maker of a well known type of power lawn mower. Some of the newer and heavier types have been used successfully in farm power tractors. Many fire departments use Continental motors for pumping water, hoisting water towers and similar purposes. They are also used in mines to operate pumps. Inspection cars on railroads are now generally power driven and Continental motors are used in cars produced for this purpose. Motors taken from motor cars have been applied by farmers to many farm implements, such as operating feed choppers, churns and wood saws.

ANOTHER ISSUE OF THE DEALER.

The July issue of Dealer, published by Auto Parts Company, 702 Eddy street, Providence, R. I., and sent free of charge to dealers, jobbers and garage men who "are interested in the distribution of specialties for Fords," contains a great deal of solid information, as well as good natured humor concerning Ford cars, and their makers and distributors. Judging by its contents, this country and Canada is rather thoroughly scoured for the latest Ford information.

This issue announces the willingness of the company to supply, free of charge, the Apco gasoline price card to dealers in Ford cars and specialties. The card is in the nature of a "ready reckoner," by which the gasoline dispenser can instantly and accurately estimate the selling price of any quantity of "gas," from one to 25 gallons, at any rate per gallon from eight to 18½ cents.

THE AMERICAN FORD ASSOCIATION.

An organization known as the "American Ford Association" has been incorporated with headquarters at Albany, N. Y. Among the many things it hopes to do is to amalgamate the 70,000 users of Fords in an association, which is to also include dealers and manufacturers of Ford accessories, and to arrange a basis whereby supplies and equipment can be purchased at a discount.

Other objects are, to advance the good roads movement, to influence legislation, to erect road signs, to supply touring information, to designate official hotels, garages, taxi and other services, to

sanction contests, to interest women in its objects, to print a monthly publication in which its members can advertise.

Membership costs \$1 a year and with it goes badges and a subscription to the publication.

GOODYEAR PUTS OUT NEW RIM.

A light and much simplified design of rim in both the detachable and quick detachable, demountable types has been put upon the market this year by the Goodyear Tire and Rubber Company. On this rim the side ring and locking flange are combined and can be snapped off. With the detachable, demountable type the tire cannot only be taken off very quickly, but it is equally easy to remove the tire from the rim on which it is mounted and replace it with an extra tire. The rim bases of both types are solid—weather proof and water proof and lacking the split in the middle. The fastener is designed to fasten the rim so closely to the felloe that no squeaking can result from the play of the rim on the felloe.

CONTROLS KING ADVERTISING.

The Ward & Gow agency of New York City is in complete and exclusive charge of all advertising for the King Motor Car Company, Detroit, including the selection of mediums, preparation of copy and production of art work.

Space to the value of \$350,000 will be used during 1915. Car cards in 152 towns and cities in all parts of the country are a feature of this campaign, closely connecting the advertising with local King dealers. Thirty-three leading farm papers have been used since June, and the August-September list includes 24 national magazines, embracing practically all of the foremost weeklies and monthlies.

W. B. Nesbitt is manager of King advertising for Ward & Gow.

* KISSELKAR COVERS BAD ROADS.

A 2000-mile cross-country tour in a Kissel all-year car, with removable sedan top, has been made by E. L. Lindbloom and a party of friends from San Mateo, Cal. The first leg of the run was 208 miles to San Francisco, during which the motor was not stopped even once. The party arrived in Los Angeles in 22 hours of running time after the start. They crossed some very bad roads and at high altitudes ploughed through snow for long distances. No mechanical difficulties developed and there was no tire trouble. The

car made $12\frac{1}{2}$ miles on each gallon of gasoline. Only one gallon of water was used to refill the radiator on the entire trip. The closed body was found to be a great convenience in the bad weather that was encountered.

GOODYEAR TIRES ON MILITARY CARS.

A fleet of armored Cadillacs have just reached the Pacific Coast from the Northwestern Military Academy, near Chicago. The cars were driven by cadets from the academy under the direction of Col. R. P. Davidson, president of the institution.

All of the cars were equipped with Goodyear Cord tires. Three of the cars reached the coast with Chicago air in all tires and nearly all of the front tires came through without a particle of trouble. Some punctures of rear tires were experienced on the trip.

Road conditions could hardly have been worse. There was an unprecedented amount of rainfall and the cars literally plowed through the gumbo in the western states. An army observer accompanied the cars and the result of the trip is expected to have some influence on the government's selection of military cars other than transport trucks. Col. Davidson made copious military notes on the trip for the benefit of the War Department. Boys of the Northwestern Academy have had several years of motoring experience. They had two armored cars in the 1910 Glidden tour, and gathered much valuable information.

"SEE AMERICA FIRST."

To aid the tourist in selecting the route of his summer trip, the touring bureau of the B. F. Goodrich Company, Akron, O., has issued a booklet called "See America First," which describes tours in all parts of the country. It is illustrated with excellent photographs and contains talks on roads and the things that can be seen in various sections. There are chapters on "New Hampshire's Mountains," "Yellowstone—Land of the Geyser," "Riding Into Dixie Land," "The Lure of the Great Northwest." After having chosen his tour, with the aid of this book, the tourist can

without charge secure road directions for the trip from the Goodrich road books, which now cover every state. These are distributed from the company's branches or are sent to any one on receipt of a two-cent stamp.

U. S. MILLIONAIRE ABANDONS CAR.

How an American millionaire, travelling in New Zealand, left a big Thomas "Flyer" on the dock at Wellington rather than take the trouble to have it crated up and shipped after him, is told in a letter to The Automobile Journal from Huron P. Gibbons, a reader, residing in Wellington.

A newspaper clipping from a Wellington paper enclosed in the letter states:



Military Cadets Testing Armored Automobiles, Equipped with Goodyear Cord Tires, on Transcontinental Tour.

"At a recent sale of unclaimed goods left with the harbour board, a six-cylinder, 90-horsepower American racing automobile was sold by Mr. J. Dykes, a local auctioneer, for £360 (\$1800). The machine is said to have been left in Wellington by an American millionaire, who, having toured New Zealand with it, became bored with the prospect of having to ship it back to the States, and simply left it on the wharf, careless of what became of it. It is stated that the car, which has both a touring and a racing body, originally cost £1700 (\$8500). Its dashboard is covered with metal emblems of motor touring clubs of nearly every country in the world."

Mr. Gibbons adds that the car has a six-seated touring body and bears the registration number "In S 852."

PRACTICAL FACTS FOR NEW CAR OWNERS.

Simple Tire Repairs and the Correct Method of Accomplishing Them—Queries— Suggestions as to Repairs and Operation.

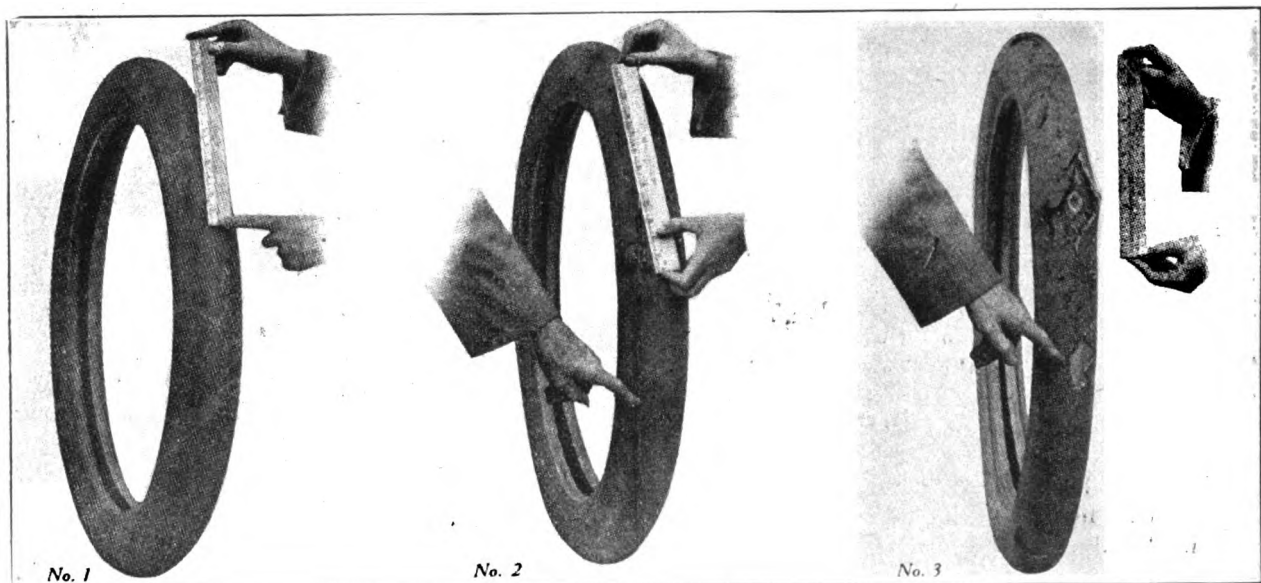
THE average new owner possesses neither the temerity nor facilities to attempt more than the simplest of tire repairs. The range of his activities in this line is generally confined to minor and temporary repairs. However, limited as these are, the owner should know certainly how these should be accomplished.

The seriousness of the hole in the tire casing is in proportion to its size—when it is large enough to permit the inner tube to be blown through, then it is usually beyond the owner's attention, and sometimes beyond that of the professional repair man. This is more certainly true

the name of friction cloth. It should be large enough to extend several inches on each side of the cut and from bead to bead.

The inside of the casing around the cut should be thoroughly cleansed with gasoline or benzine, and when it is absolutely dry three coats of cement applied. The friction cloth should be given a coat of cement, and the coats on the cloth and the inside of the casing allowed to become "tacky." To give additional strength a blowout bandage may be used on the outside.

At best this is but a makeshift repair and at the first opportunity the casing should be sent



Ruined Through Neglect—No. 1 Shows a $\frac{3}{4}$ -Inch Cut, Probably Made by Small Stone, Which the Owner Forgot to Remove; No. 2 Illustrates How Cut Extended to Two Inches; No. 3 Shows the Tire's Complete Downfall, Which Might Have Been Avoided by Daily Inspection.—Illustrations by Courtesy of Goodyear Tire and Rubber Company.

of old tires that have undergone long and hard service and have had the rubber tread almost all worn off and the fabric weakened.

In a casing that is otherwise in good condition, a cut may be repaired temporarily and the tire will still give many miles of running. To make this repair obtain a patch of one or two thicknesses of heavy canvas, with a dressing of rubber cement on one or both sides—it is sold by all garages and supply stores, usually under

to the repair man to be vulcanized.

If the operator will go over the tires every night, picking out any gravel, glass or stones that may have become lodged in the rubber during the day, he will save money. These sharp articles will work their way into the rubber until they penetrate the fabric and the inner tube, which will result in a puncture. After they have been removed, the holes remaining should be sealed with a good cement and a specially pre-

Tarvia

*Preserves Roads
Prevents Dust-*

A Consistent Policy of Road Improvement

PLAINFIELD has joined the long list of towns that have formed the habit of using tarvia to preserve their roads and prevent dust. The success of tarvia in Plainfield is a simple case of the survival of the fittest.

In 1908 we sold one tank car of tarvia to the city of Plainfield. In 1909 we sold them two tank cars. At the same time they were using various oils for the prevention of dust.

Year after year Plainfield used less of the oils until in 1914 the city bought 106,000 gallons of "Tarvia B" and only 17,000 gallons of all other materials put together. About 36 miles of macadam roadway were treated with "Tarvia B".

This consistent policy has brought about a notable improvement in the condition of many of the streets of Plainfield, while those which were already in good order have been pre-

served in first-class condition, where otherwise they would have fallen into speedy disrepair under modern traffic.

Tarvia is a dense, viscid, coal tar preparation, made in three grades to suit varying road conditions. The grade used in Plainfield was "Tarvia B", the lightest of the three. It is distributed cold from a sprinkling cart. The tarviated surface is automobile-proof, water-proof and dust-proof. It lasts so much longer than a surface of plain macadam that the extra cost of the tarvia is more than repaid by savings in maintenance.

Plainfield, like many other towns, uses tarvia primarily for the reduction of the annual road taxes and saves a lot of money by the process. Citizens appreciate tarvia because it relieves them from the old dust nuisance and gives them clean, slightly, mud-proof, automobile-proof streets.

Illustrated booklet on request

Special Service Department

This company has a corps of trained engineers and chemists who have given years of study to modern road problems.

The advice of these men may be had for the asking by anyone interested.

If you will write to the nearest office regarding road problems and conditions in your vicinity the matter will have prompt attention.

BARRETT MANUFACTURING COMPANY

New York Chicago Philadelphia Boston
St. Louis Cleveland Cincinnati Pittsburgh
Detroit Birmingham Kansas City
Minneapolis Salt Lake City Seattle
THE PATERSON MFG. CO., Limited:
Montreal Toronto Winnipeg
St. John, N. B. Halifax, N. S.



West Seventh Street, Plainfield, N. J. A typical tarviated road.

(When Writing to Advertisers Please Mention The Automobile Journal.)

More Power Less Gasoline
FORD and OVERLAND
 Owners Save Money



This improvement that really improves, the Wilmo Patent Combination Manifold (in single casting), reduces your gasoline bills **nearly one-half**. In the Wilmo Manifold the heat of the exhaust thoroughly vaporizes the gas inflow, ensuring more power and higher efficiency, less gas and minimum carbon deposit than when the mixture is delivered to the cylinders wet and cold. No machine work required to attach the Wilmo in place of old manifold. Anyone with ordinary tools carried in repair kit can change in few minutes.

SPECIAL INTRODUCTORY OFFER
 During Month of August

A FREE TRIAL. Send us your name and address, make and model of car, license number and dealer's name, and we will ship you prepaid a Wilmo Manifold. Try it **free**. After 30 days, if satisfactory, pay us \$10 (\$7.50 for Ford), or keep without paying us a cent by fulfilling offer we will send you. Ask for it. Better write today.

WILMO COMPANY, 1261, 208 So. La Salle St., Chicago

The Hotel Van Rensselaer

15 to 19 East Eleventh Street
NEW YORK

Close to Washington Square.

In the heart of the fashionable residential district—just east of Fifth Avenue and one minute from Broadway.

Terms—Single Room, with detached bath, \$1.00 per day.

Double Room, with detached bath, \$1.50 per day.

Single Room, with private bath, \$1.50 per day and upward.

Double Room, with private bath, \$2.00 per day and upward.

American plan—room and meals, \$2.50, \$3.00, \$3.50 per day.

Suites—parlor, bedroom and private bath, including all meals for one, per week, \$22.00 up; for two, per week, \$28.00 up.

Just the Place for Your Mother and Sisters Where They Will Receive the Best of Attention and Protection

Especially low rates by the week during the summer months
Write for Circular

JOHN HARRIS - - Manager

HAVOLINE OIL

"It Makes a Difference"



Garageman: "You can't go wrong if you recommend HAVOLINE OIL."

Helper: "I find our customers ask for it. They say they see it advertised."

Garageman: "You know we want to run a perfect service station, and the oil proposition is a serious one. It has been our policy to recommend only the very best."

Helper: "How did you decide on HAVOLINE?"

Garageman: "After exhaustive tests we found we get as much, if not more, lubrication and less carbon than from any other oil."

Be sure you sell the oil in the Blue and - White Can with the inner seal. We offer the garagemen the best packaged goods proposition on the market. Write for our Representative or for full information. Be sure and write for the "Sales Order."

INDIAN REFINING COMPANY
 Dept. L. New York



For Perfect Control and Safe, Comfortable Driving use

Weed Anti-Skid Chains

At all Reputable Dealers

WEED CHAIN TIRE GRIP COMPANY, BRIDGEPORT, CONN.

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MAGNETOS



S. R. O.
BALL BEARINGS



Sole Importers

MARBURG BROS., 1790 Broadway, NEW YORK

Peerless Quality in Smaller Size

"ALL PURPOSE" FOUR AND SIX
FOUR AT \$2,000 (Sixes \$250 Extra)
THE PEERLESS MOTOR CAR CO., CLEVELAND, OHIO

Makers also of the "48-Six" and Peerless Trucks.
 Licensed under The Kardo Patents.

F. SHIRLEY BOYD

175 Massachusetts Ave., Boston, Mass.

R. I. V. Ball Bearings.

Baldwin Chains and Sprockets.

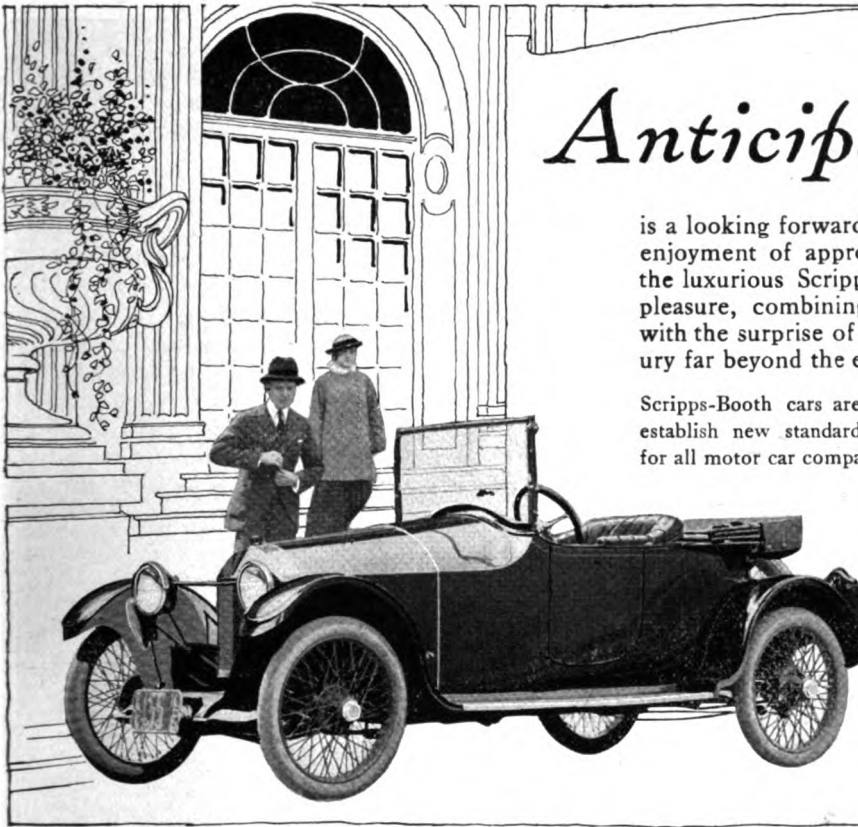
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AUTOMOBILE ELECTRIC LIGHTING SPECIALTIES

For the Automobile Owner and Manufacturer who wants SERVICE for his money

ELECTRIC LIGHTING SPECIALTIES Made to Order
CULVER-STEARN'S MFG. CO.
 Worcester, Mass. Detroit, Mich.

(When Writing to Advertisers Please Mention The Automobile Journal.)



Anticipation

is a looking forward to pleasure—an advance enjoyment of approaching good. A ride in the luxurious Scripps-Booth is thus a double pleasure, combining the joy of anticipation with the surprise of an unexpected riding luxury far beyond the expected realization.

Scripps-Booth cars are beyond all anticipations, and establish new standards of performance and comfort for all motor car comparisons.

Scripps-Booth Company
Detroit Mich

Roadster \$ 775
Coupe 1450

pared "plastic," which all tire dealers have for sale.

Inner tubes are extremely delicate. They are the air bags that contain the air and should be treated as important units of the car equipment.

One of the simplest methods of locating leaks in a tube is to partially inflate it and revolve it in a tub of water. The escaping air will create bubbles, and indicate the point of leakage. In lieu of a tub of water, saliva applied to the suspected spot will give satisfactory results.

Mark the spot with a pencil, if possible, and thoroughly cleanse the section around the leak. Sandpaper both tube and patch to remove the sulphur bloom and to give an adhering surface. The cement and patch should be applied as in the case of the tire shoe, only in that the tube should be put in a press until dry. A makeshift press can be had by placing the tube between two flat boards, the owner standing upon them.

There are many ways in which the new owner can minimize the possibilities of accidents and wear. The following hints are generally recognized as good practise:

Select a dry spot in the road or garage for your car to stand in.

(When Writing to Advertisers Please Mention The Automobile Journal.)

Use your brakes with judgment and turn corners slowly—nothing will wear tires faster than sudden locking of the rear wheels, and turning corners at high speed.

Always use tires of the same dimensions. Varying sizes cause unequal traction and the differential gears will work even though both rear wheels drive on the ground. If compulsory, it is better to have the unequal sized tires on the front wheels.

Place repaired tires on the front wheels, and new ones on the rear.

READERS' QUERIES.

Suggestions to Owners—How Multiple Disc Clutches Operate, Installing Master Vibrator, Overcoming Noisy Floorboards, Correcting an Oil Gauge.

Computing Horsepower—T. H., Tampa, Fla.

Will you please publish the formula by which the S. A. E. computes horsepower?

The formula adopted by the Society of Auto-

DIXIE 20TH CENTURY MAGNETO

Leaders Use
DIXIE
20th Century Magneto
4-cyl.—6-cyl.—8-cyl.—12-cyl.
--Others Use Just Ignition.



SPLITDORF
Electrical Co.
NEWARK, N. J.

(All SPLITDORF features are fully covered by patent or patents pending)

THE COAST LINE TO
MACKINAC
DETROIT, TOLEDO,
CLEVELAND, BUFFALO, PT. HURON, ALPENA,
NIAGARA FALLS, ST. IGNACE.

A LAKE TRIP FOR REST AND RECREATION
Have a real vacation on the Great Lakes, the most enjoyable and economical outing in America. The cool lake breezes, the ever-changing scenes along the shore, and the luxurious steamers of the D. & C. Line are positive guarantees that you will enjoy every minute of your trip, and return home refreshed and glad you went. Daily service between Detroit and Cleveland and Detroit and Buffalo. Four trips weekly from Toledo and Detroit to Mackinac Island and way ports. Two trips weekly, special steamer, Cleveland to Mackinac Island, no stops enroute except Detroit and Alpena. Special day trips between Detroit and Cleveland during July and August. Daily service between Toledo and Put-in-Bay. RAILROAD TICKETS AVAILABLE FOR TRANSPORTATION on D. & C. Steamers between Detroit and Buffalo or Detroit and Cleveland either direction. Send two-cent stamp for illustrated pamphlet and Great Lakes map. Address L. G. Lewis, G.P.A., Detroit, Mich. Detroit & Cleveland Navigation Company
Philip H. McMillan, Pres., A. A. Schantz, V.P. & G.M.
All Steamers arrive and depart, Third Ave. wharf, Det.



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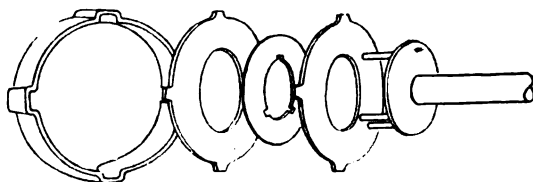
mobile Engineers is $D^2 \times N$, divided by 2.5. D represents the diameter of the cylinders, or, in other words, the bore. Expressed in another way, square the bore and multiply that product by the number of cylinders and divide that result by 2.5.

Example: The bore of a six-cylinder motor is $3\frac{1}{2}$ inches and the stroke is five; $3\frac{1}{2}$ squared equals 12.25, which multiplied by the number of cylinders, six, gives 73.50. This divided by 2.5 brings the quotient to 29.4, which is the horsepower of the motor, according to the S. A. E. formula.

Multiple Disc Clutch—T. H. K., Newton, Ia.

Is it true that some types of multiple disc clutches operate in oil? If so, I do not understand how a grip is obtained, as the oil would have a tendency to cause slipping. Can you make clear to me the arrangement of the plates in this type of clutch?

You have been correctly informed. The majority of modern multiple disc clutches operate in an oil bath. A medium oil must be used, however, and not infrequently a mixture of oil and



Arrangement of Plates in a Multiple Disc Clutch.

kerosene is used for this purpose. The use of lubricant on the plates make for long service, as well as for a gradual engagement. As the plates are gradually engaged, the oil film is pressed out by the tension of the strong compression spring, or springs, until a firm gripping surface is obtained.

Of course there is a certain amount of slipping while the oil is being pressed out. However, this is a desirable quality, as it permits the power to be applied gradually instead of delivering it in a jerky action. The arrangement of the plates is shown in the accompanying illustration. Here is shown two sets of plates, one of which is driven by the flywheel, or engine shaft, and the other set is connected to the driven member, which has connection with the transmission. These plates are alternately arranged. When these plates are pressed inward by a strong spring a direct connection between the gearset and engine must be the result. When the spring is compressed the plates automatically separate, thus freeing the engine.

Installing Master Vibrator—H. B. F., Chicago, Ill.

I own a Ford touring car and would like to install a master vibrator on it. Can you explain how I will complete this operation? Do you not think that there are many advantages to be gained by using a master vibrator?

A master vibrator will no doubt improve the ignition, as it eliminates the use of the separate vibrators and substitutes one well constructed vibrator that breaks the current for all coils. Hence a single adjustment will furnish a uniform spark in each cylinder. The first operation necessary is to attach the master vibrator as near to the old coil as possible. Next trace the wire running from the magneto to the coil and remove the end from the latter and attach it to the terminal marked "M" or "Mag." on the master vibrator. From a terminal of the vibrator, which is neither marked Mag. or Bat., run a wire to the old coil and connect it to the post from which the magneto wire was removed. If desired the re-

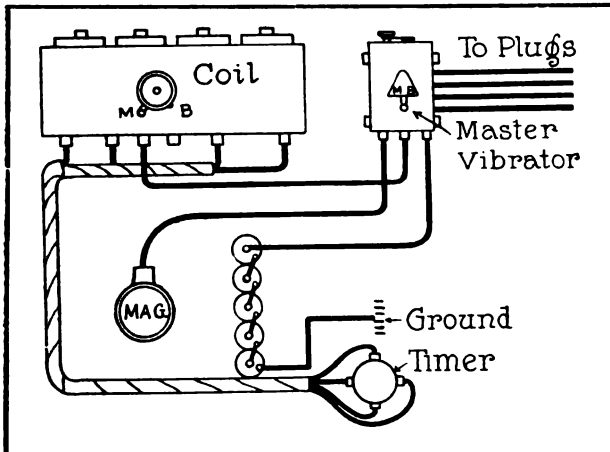


Diagram Showing How to Install Master Vibrator on a Ford Car.

maining post may be wired to a set of dry cells, if not already connected. However, if the old coil is wired for battery ignition, this connection should be removed. When the wiring is done, as shown in the accompanying illustration, the coil switch can be left on Mag. and the current action controlled by the master vibrator switch.

Clutch Does Not Engage—G. H. R., Worcester, Mass.

I have a cone clutch of the leather to metal type. When I engage the clutch it does not readily take hold, but if I pull on the foot pedal it will grip and gives no further trouble. How can I remedy this trouble?

You do not state whether the clutch snaps in when the foot pedal is pulled, or if the clutch merely slips when first engaged. If the former is your trouble the female member of the clutch is out of alignment with the male section. This trouble is no doubt because of worn bushings. If the clutch merely slips when let in, it may be

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METZ '25'

The Quality Car



1916 MODEL

\$600 Completely Equipped

Including Electric Starter and Electric Lights

DEALERS will find this new METZ model a very attractive and profitable proposition. It has all the refinements and the leading improvements in construction and equipment which distinguish the up-to-date car. Is delightfully easy-riding and luxuriously finished. For reliability in road performance it is unsurpassed. Its remarkable hill-climbing ability, simplicity in operation, upkeep economy, and absolute freedom from gear and clutch trouble are strong selling features.

Write us for Dealer particulars and new catalog "Q"

METZ COMPANY, WALTHAM, MASS.

EISEMANN

The most simple—the most accessible—the most durable—the most efficient magneto ever produced is the new Type G-4.

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**Why Pay Excessive Hotel Rates?****THE NEW AMSTERDAM**

Euclid Avenue at 22nd Street, CLEVELAND, OHIO

A five minutes walk from the active centres, yet overlooking the most beautiful residence section of Cleveland.

"The logical resting place for tired Tourists."

Large airy suites of from two to five rooms (also single rooms.)

GARAGE NEARBY

RATES:—\$1.50 per day, each person

Dining Room Modified *a la Carte*

A. A. McCASLIN, Managing Director

L. McNAMARA, Manager



HARRIS
TRADE MARK REG. U.S. PAT. OFF.
OILS
AND
GREASES

90% of motor ills are traceable to faulty lubrication. Often an inferior lubricant is directly responsible—a lubricant with an asphaltum base.

HARRIS OILS and GREASES, made of finest Pennsylvania Crude have a *paraffin* base. Paraffin is a *lubricant*—asphaltum is not. Asphaltum means carbon deposit. There is not a trace of it in HARRIS products.

The wiser, more progressive dealers are handling HARRIS OILS and GREASES. * Their customers who have tried these pure oils accept no others. Remember,

"A Little Goes A Long Way and Every Drop Counts."

Sold in Bbls., Half Bbls., 10 Gal., 5 Gal., and 1 Gal. Cans—also in special iron drums in three sizes, 50 Gallon, 30 Gallon and 15 Gallon quantities. These are equipped with convenient faucets.

A. W. HARRIS OIL CO.,
326 S. Water St. Providence, R. I.
Branch: 143 No. Wabash Ave., Chicago, Ill.

Write for full particulars




**Why Freeze Yourself?
Ruin Your Auto?**

**The Superior
Safe Garage Heater**

SAFE. NO FUMES.
NO GASES

Equipped with pilot light. No matches, no danger, no discomfort. An ideal positive heater.

SUPERIOR MANUFACTURING CO. N. S. Pittsburgh, Pa.



BALL BEARINGS REGROUND

at one-fifth the cost of new, also New Single Row Annular, Thrust, New Departure Double Row and Radax Bearings.

AHLBERG BEARING CO.

Boston Chicago Detroit New York
Los Angeles Cleveland St. Louis, Mo.

VALVOLINE OIL CO.

Heavy, Medium and Light
Automobile Oils

27 STATE STREET BOSTON, MASS.

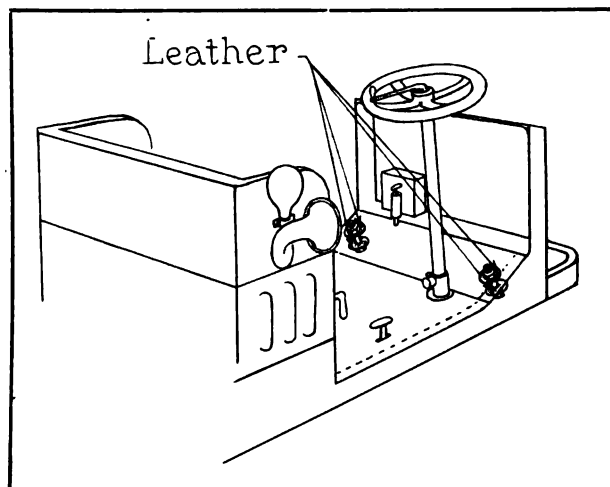
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that the spring tension is weak. If the leather band is coated with grease or is glazed over, the member should be washed thoroughly with kerosene and then treated with castor or neatsfoot oil. It may be that the rivets are above the leather surface and if they cannot be driven down a new band should be fitted.

Noisy Floorboard—B. G. J., Kingston, Mo.

Can you suggest any method of silencing the front floorboard of a 1914 two-cylinder truck? It is made of metal and sets at an angle. Oil does not seem to improve the condition.

The noise is no doubt the result of a metal to metal contact and can usually be remedied by placing a thick lubricant at the point of contact. However, as you have tried this without success, try the remedy shown in the accompanying illustration. On this type of truck the front floorboard is retained by two bolts. The nuts should



Leather Washers Overcome Noise from Floorboards.

be unscrewed and the board removed. From a thin strip of soft leather cut four washers. Place one over each bolt and then replace the floorboard. The remaining washers can then be placed on top and the nuts firmly screwed down.

Oil Gauge Needs Correcting—J. L. H., Mansfield, Mass.

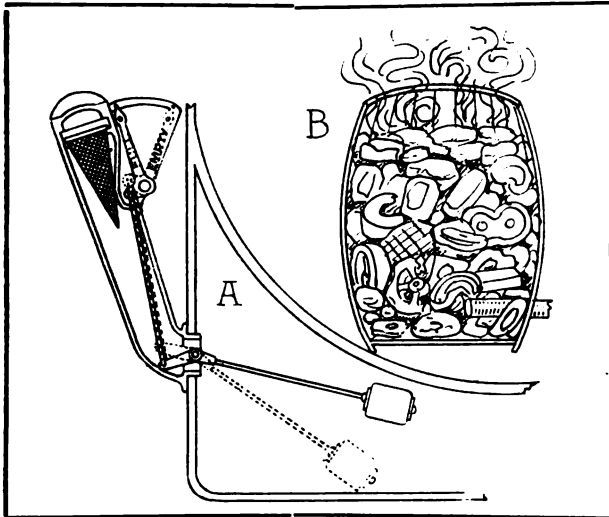
Can you explain the cause of a four-cylinder Reo touring car having a smoky exhaust when the crank case is nearly empty. When I pour in oil, until the gauge indicates "full," large volumes of smoke appear from the muffler, and the motor misses.

The oil gauge needs correcting, as the smoke and missing are the result of an excessive oil supply. Drain off all the oil in the crank case and then pour in about three quarts. The indicating finger should now register "full;" if not, it should be bent. The accompanying illustration shows the design of the oil gauge used on the Reo car. The oil gauge casting is bolted to the side of the

crank case by two screws, and these should be removed and the instrument taken off. The wire holding the float should be bent down and then the gauge attached to the machine. If the indicator does not register "full," remove the gauge and bend the wire a little more. Repeat the operation until the desired point is reached. The hand of the gauge indicates two quarts of oil between empty and full. This means that with the pointer registering empty, there still remains about one quart of lubricant in the reservoir. It is not advisable to run for any distance when the gauge indicates that the oil is exhausted.

HISTORY OF THE MUFFLER.

The muffler is used on every type of automobile, except those designed for racing purposes. The function of this attachment is to silence the noisy exhausts of the engine. In the earlier pe-



A, Oil Gauge of a Reo Car; B, Prototype of Modern Muffler.

riods, when the gasoline motor was only used for stationary purposes, the objectionable feature that was difficult to overcome, was the loud reports of the exhaust. Many means were resorted to, such as running pipes to large brick vaults built under the ground, while others ran pipes to large tanks filled with broken castings, rock and other material.

It is obvious that these were but crude devices and could not fully silence the noise. At length the excessive noise was considered a public nuisance, and in many parts of the country ordinances were passed permitting the gasoline engine to be operated only during certain hours of the day. As time passed, it was discovered that the report of a rifle could be silenced by placing a

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BOSCH

THE ignition that
is used by the
world's fastest cars
because it is the most
reliable and efficient.

Be Satisfied

Specify Bosch

Bosch Magneto Co.

204 West 46th St.,

New York

Over 300 Service Stations back up Bosch Users.

Vulcanizers—Air Bags That Stand Hard Use



Long Life in Goodyear

If you have troubles with sectional air bags in repairing tire casings, end them now. The Goodyear Air Bag is made to give you the service you have long demanded. The Goodyear Sectional Air Bags are made of durable fabric and will not "burn up." They last with ordinary treatment for 50 cures. They are easy to handle, too. They have a rawhide loop in the end for removing bag from casing. This prevents breaking off the valve stem, a common occurrence with ordinary air bags.

It is these little perfections of detail that have given to Goodyear Repair Materials their present prestige among dealers. You should know more of these Goodyear Tire Accessories—22 Tire Savers. There is a big profit to you in selling accessories that stay sold because of satisfaction rendered.

Write for our complete list, with your prices and profits. Address Desk 48.



THE GOODYEAR TIRE & RUBBER CO., AKRON, OHIO
Makers of Goodyear Fortified Automobile Tires. (2135)



CATARRH---ASTHMA---HAY FEVER

Bronchitis, etc., are the direct result of germ life—taken into the system through respiration. Immunity from these diseases is simply a matter of protection from germ laden dust. "O-ZEL-O" not only affords absolute protection from dust germs, but positively destroys all germ life which may be present. You breathe its healing, antiseptic vapor for hours at a time—while you work, sleep or play. Price, complete outfit \$2. Let us tell you about it.

THE O-ZEL-O CO., Dept. A54,
Fort Wayne, Indiana.

HOTEL MAJESTIC

Central Park West at 72nd St.,
New York

Copeland Townsend, formerly Manager of the Hotel Imperial, New York, is now proprietor of the Majestic.

Overlooking Central Park and away from the noise and heat of lower Broadway, the Majestic offers to motorists a haven of quiet and rest after a tedious journey. During the summer season small suites consisting of sitting room, bedroom and bath may be secured at very low prices.

The Cafe Moderne and the roof garden, offer dancing nightly.

NOTICE FOR OWNERS AND CHAUFFEURS:

Coming into New York via Broadway, or down Fifth Ave., you will find this hotel conveniently located at the 72nd St. entrance to Central Park. A splendid garage just around the corner.

COPELAND TOWNSEND
Managing Director



WHY USE INFERIOR PLUGS WHEN CENTERFIRE

can be bought at the same price? They overcome all Engine troubles, fire where others fail and Add Power to engine. Any length point desired made to order. Try them and you will use them—always Make a trial and save money. \$1.00 each, 6 for \$5.00.

GUARANTEED

Agents wanted and special prices to dealers.

Milwaukee Auto Specialty Co.
705-707-709-711 Chestnut St., Milwaukee, Wis.

TEXACO MOTOR OIL

REXO II \$3⁸⁵

The GARFORD MANUFACTURING COMPANY, 2506 Olive St., ELYRIA, O
Successors to THE DEAN ELECTRIC COMPANY

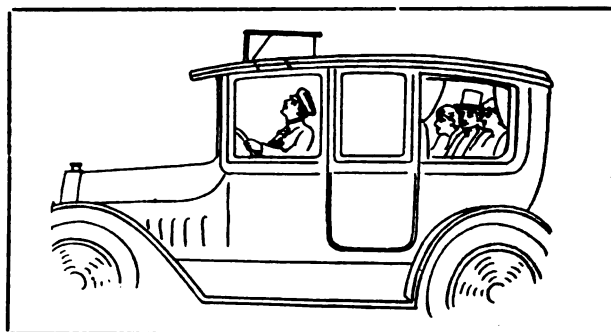
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small expansion chamber, containing several pockets, at the end of the barrel. However, this device was not adapted to the gasoline engine, as a great many exhausts occur to the minute and the gas must be quickly expelled, while the rifle is fired but once and the gas has ample time to escape before the next discharge, and back pressure did not have to be considered.

The first improvement of merit on an engine muffler was made by inserting perforated baffle plates at equal distances apart in a steel drum. This muffler is used extensively at the present time on many of the earlier cars. This type is, however, only suited to slow speed engines, as the plates soon soot and become clogged. They are very difficult to clean and more so to repair.

OVERHEAD MIRROR FOR LIMOUSINES.

Various locations have been tried for mirrors so that the driver may see the traffic which is



Overhead Mirror Affording View of Traffic in the Rear.

following and allow him to stop or turn in safety. An advantageous position for this mirror, which permits the driver to see all the traffic at the rear, was noticed recently on a limousine and is illustrated herewith. A hole is cut in the top and a weather proof box, having a rear opening, built over it. The mirror is then set at an angle in the box and by looking into it the driver can see the traffic which is close and directly behind his machine. If desired the box opening can be fitted with plate glass so as to be proof against the weather.

SIMPLE TEST FOR LEATHER BELTING.

The motorist can easily conduct a simple test to accurately determine the quality of the material used in fan belting. Place the small strip in a quantity of strong vinegar and if the material is of high quality no great change will be evident, except for the changing of the color to a darker shade. If the leather is of poor quality, however,

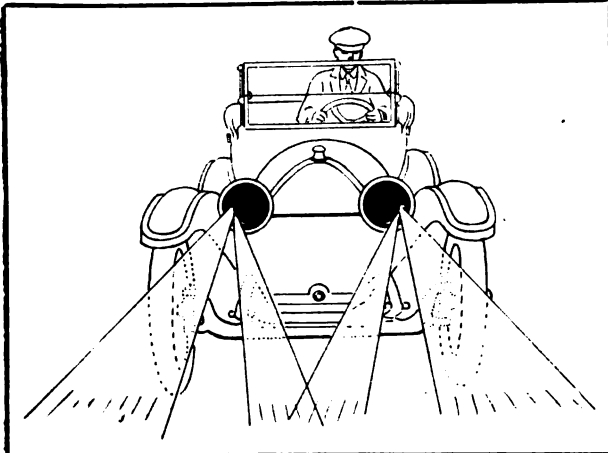
the fibre will quickly swell and the material will change into a gelatinous mass.

RESTORING DRY CELLS.

A weakened dry cell can be revived, to a certain extent, by adding water, muriatic acid or vinegar, which can be injected through a small hole punched in the sealing compound of the cell. The liquid wets the electrolyte and depolarizer and accordingly "excites" the battery.

GLARING HEADLIGHTS.

A practical method of eliminating the glare of automobile headlights, which has met the approval of the police in many English cities, recently appeared in the Autocar, an English publication. Referring to the accompanying illustration.



Painting Headlights to Eliminate Glare.

tion, it will be seen that the front glass of the lamps has been painted black, with the exception of a crescent shaped space at the bottom edge a little to the outside. The rays of the light are consequently directed forwardly and downwardly, but furnish ample light for illuminating the side of the road. Absolutely no glare results from this arrangement, yet sufficient light is supplied for safe driving.

FORCING FUEL TO THE CARBURETOR.

With automobiles, equipped with the gravity type of gasoline feed, trouble is often encountered in climbing steep grades when the fuel supply in the tank is low. The engine will generally stop with a loud explosion. This is the result of the gasoline flowing back in the tank, away from

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YOU'RE not getting as much gasoline and oil mileage as when your car was new. You've noticed an increase in consumption and there's been the recurring expense of cleaning out excessive carbon.

Piston rings are to blame—and the way to stop the waste effectively, to eliminate carbon trouble and to restore full power is by installing

LEAK-PROOF Piston Rings

Made by McQuay-Norris Mfg. Co.

The only really gas- and oil-tight piston rings made ; because they incorporate in their design a mechanical principle essentially correct and exclusively identified with them.

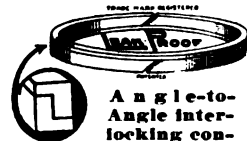


Genuine **Leak-Proof** Piston Rings are two-piece rings—of angle-to-angle interlocking construction—providing perfect bearing within and without—exactly fitting—permanently efficient. They give maximum power—save fuel and oil—reduce carbonization.

Send for Free Book—"To Have and to Hold Power"

It explains the theory and function of piston rings. It tells about the **Leak-Proof** Ring and why every motor should be equipped with them. How it will pay you in fuel economy and prolonged motor life. Write for it.

"Ask the User"



In use on over
300,000 motors.

Angle-to-Angle Interlocking construction identifies **Leak-Proof—Insist.**

Sold by all up-to-date supply houses, garages and repair shops.

Manufactured by

McQUAY-NORRIS MFG. CO., Dept. D. ST. LOUIS, U. S. A.

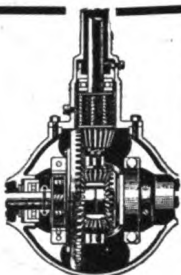
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Differential Lubri- cation IS VITAL

Its bevel gears and ball and roller bearings must be unfailingly lubricated. Its mechanism is a hot-bed of friction when lubrication fails. Insure proper lubrication, by using



TRADE MARK
NON-FLUID OIL
REGISTERED IN
UNITED STATES PATENT OFFICE

NON-FLUID OIL is especially adapted to this exacting requirement. It never fails to envelop the gears and bearings with a heavy coat of durable lubricant—not merely wet them like oil, or film them like grease. The gears never fail to mesh in a soft, yielding cushion—metal never touches metal—the only wear is a slow, oily polish which transmits power with least friction and with least loss.

**Get a Can Today and
Prove It.**

"K. No. 000" for differential compression cups and all bearings.
"K. No. 00 Special" for sliding gear transmission.

Avoid Substitutes

Reduced Prices for 1915.
Ask Your Dealer.

New York & New Jersey Lubricant Company

165 Broadway, New York
1430 Michigan Ave., Chicago.



Dixon dealers display photo-testimonial window display cards of all prominent racing drivers. It helps to win attention and sales. Offer No. 210-G.

JOSEPH DIXON CRUCIBLE COMPANY
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SPEDOLENE solves the problem of automobile and motor truck gear lubrication. One trial is all we ask. "A fair field and no favor" will demonstrate to your satisfaction that **SPEDOLENE** is the King of all lubricants for gears.

Henry H. Kroh, Boston Distributor,
MANUFACTURED BY
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Hartford

SHOCK ABSORBER

SOOTHES THE ANGRY SPRING

Hartford Suspension Co.

Jersey City, N. J.

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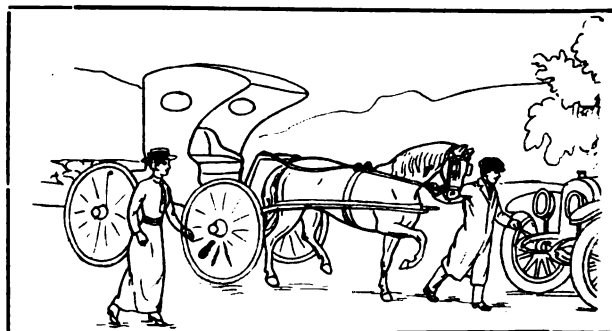
\$2.00 the Year

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the feed pipe to the carburetor. Placing more gasoline in the tank will overcome this, but if this cannot be easily obtained, a simple remedy is to turn the car around and reverse up the hill. It is obvious that this forces the gasoline to flow to the front of the tank and affords gravitation. This principle also applies when the grade is very steep and will not permit a gravity flow.

PASSING A NERVOUS HORSE.

Many states have statutes to the effect that a motorist shall stop his car when the driver of a nervous horse holds up his hand or gives some other similar signal. If the driver of the horse is of the gentle sex and the horse is nervous, the chivalrous motorist will lead the horse past the machine. It is always good policy first to allow the occupants of the carriage to alight. A number of serious accidents have occurred through improper leading. The mistake most commonly made is the grasping of only one rein and walk-



Proper Method of Holding Horse's Bridle to Avoid Accident.

ing backwards. Ordinarily the horse will not walk on a person. However, there is the danger of being thrown backwards and the carriage wheels passing over the body, should the horse suddenly bolt. Also as the pull of one rein injures the horse's mouth, at which the horse usually becomes more fractious, it is liable to free its mouth of the bit and run. The proper method of leading is shown in the accompanying illustration. Face forward and grip both reins with the right hand about six inches from the bit. Patting and talking to the animal will often tend to restore confidence. Should the horse rear, however, it is impossible for him to release his head from the bridle when the reins are held as shown.

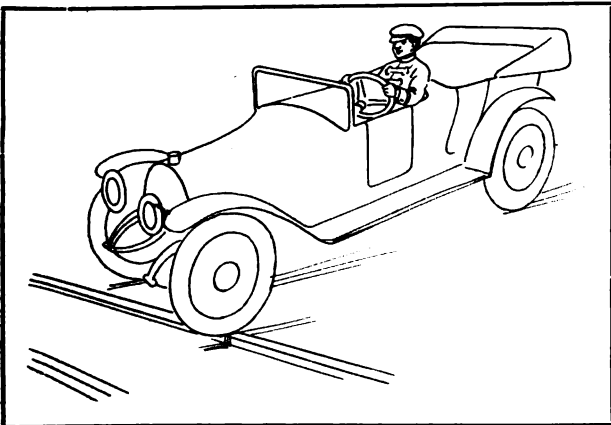
CURLED HAIR FOR WASHING HANDS.

Curled hair of the finer grade, such as can be obtained from any upholstering shop, is far bet-

ter to use for washing the hands of the automobile mechanic than a coarse brush or sand soap. A handful of this material can be made into a pad and allowed to soak in water. The soap can be applied in the same manner as to a brush. The hair has the advantage of penetrating all crevices of the hands and also removes much of the grease and dirt which settles under the nails. The hair pad will last indefinitely.

CROSSING THE HIGH PLACES.

There will be a decrease in the number of broken springs and a considerable increase of comfort if such places as railway crossings, raised street car tracks, gutters at intersecting streets, etc., are crossed diagonally instead of straight. When the obstruction is struck flush the springs receive shocks in pairs, front and rear, their impulses acting together, which causes the car to plunge and bounce. If the car crosses on the



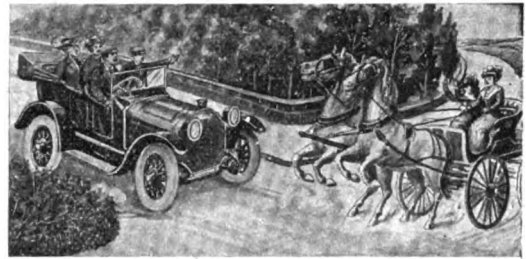
Correct Way to Cross Tracks, Etc., to Minimize Stress on Machine.

bias, each spring receives its shock separately and at different times. The result is that the impulses tend to neutralize each other and permit smooth riding. The accompanying illustration shows the method of crossing a raised street car track so as to eliminate plunging and bouncing.

HINT FOR GREASING CAR.

While working over the car it is a good policy to always place a piece of cardboard or other material, over the gear boxes when the workman is to be absent. This will prevent nuts and pieces of metal stock from falling or being dropped in. It is also well when placing the grease in the boxes to press the fingers into the lubricant. This is a precautionary measure, as frequently metal pieces will be dropped into the substance. Should

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Don't Gamble With Safety

Poor Brake Lining Is a Menace to Life and Property. Good and Efficient Lining Is a Constant Protection to Both

Specify to your dealer or repairman the Improved S-M-C Brake Lining. It is the cheapest investment that any car owner can make. It costs no more. It will last longer, give better service and affords the highest braking efficiency until completely worn through.

Improved S-M-C Brake Lining is heat resisting. It is water, oil, dust and dirt proof.

Improved S-M-C Brake Lining is made in all widths and thicknesses and sold with a guarantee that it must give entire satisfaction or money refunded. The customer is the judge.



NEW UNIVERSAL FORD TRANSMISSION LINING

Special trial set of three transmission band linings cut to length, with rivets, ready for application, packed in mailing carton, limited time price 50 cents. Regular price, 75 cents.

DEALERS: Special trade information and jobbers' and dealers' price lists on request. It will pay you to write for them today.

"SOMETHING MOR'N COTTON."

STAYBESTOS MFG. CO.


Germantown, Philadelphia, Pa.

Makers of
Asbestos, Rubber Packings, Gaskets and Radiator Hoses

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HEINZE

High Tension
MAGNETO



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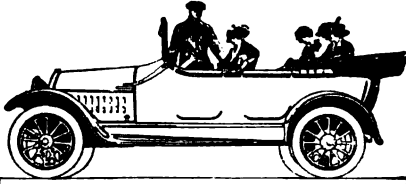
HEINZE ELECTRIC COMPANY

Make Heinze the Better Magneto

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**"The Thousand Dollar Car" at \$150 less.
SAME CAR - - NEW PRICE**

Powerful, Valve-in-Head Motor. Big, Full Five Passenger Body. Genuine Leather and Curled Hair. Floating Axle. Underlung Rear Springs. Over-size Tires. Two Unit Starting, Lighting and Ignition. "The Easiest Riding Light Car in America"



Energetic Dealers in open territory who wish to meet the keenest competition at a good margin of profit, will write or wire for our New Selling Agreement to day.

Interstate Motor Co.
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Brake Lining - 100%**

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\$3250
132" Wheelbase

MARMON "48"
\$5000
145" Wheelbase

NORDYKE & MARMON CO., Indianapolis, Ind.

American Made for American Trade

**New Departure
Ball Bearings**

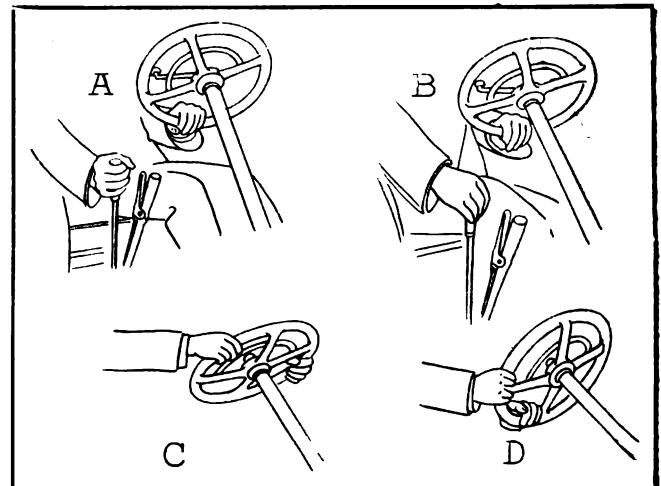
**THE NEW DEPARTURE MFG. COMPANY,
BRISTOL, CONN.**

any of these pieces become clogged in the gears the result will be disastrous.

DRIVING HINTS TO THE NEW OWNER.

Of course there is no arbitrary rule as to how a person shall operate a car, the custom being to adopt positions best suited to the operator. Some positions, however, are not only awkward, but dangerous. At A is shown a method of gripping the gear changing lever that is incorrect and absolutely unnecessary, unless there is some defect in the mechanism. When the gears are in correct alignment the operator has the advantage of being able to "feel" the change, if the lever be gripped easily at the top as shown at B.

To maintain a good transmission, it is imperative that the gears shall not be forced into mesh until the members are revolving at like speeds. At C is illustrated, what is considered by experts,



Most Practical Way of Shifting Gears and of Grasping the Steering Wheel.

as an awkward and dangerous method of holding the steering wheel. Besides tiring the muscles of the arm, it is dangerous. Should it become necessary to change gears, or reach for the emergency lever with the right hand, there is always the liability that the forward movement of the body will have a tendency to cause pressure on the left hand, thereby turning the wheel and causing the machine to change its course, and often with serious results.

A method extensively used by racing drivers, and once considered to be correct, is shown at D. It is a natural and comfortable position, the left hand, gripping the base of the wheel, maintains the position of the car, while the right hand may be used for manipulating the throttle, spark, gear or brake levers.

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STANDARD *Hartford* EQUIPMENT

FOR *Ford* CARS

LESS JOLT, LESS JAR, More Comfort for FORD Owners.

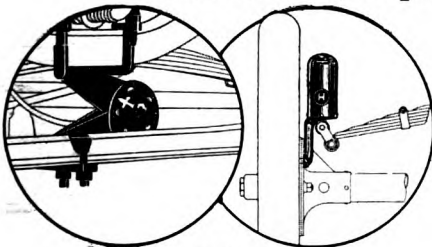
Here is a comfort combination scientifically correct and a pronounced success in practice—

FAMOUS
***Hartford**
SHOCK ABSORBER
On the front of your Ford

and

FAMOUS
Hartford
CUSHION SPRING
On the rear of your Ford

The result of a special study of Ford requirements.



Hartford Comfort Combination.

The engine of a Ford gets gasoline and air in perfect proportions when its engine is equipped with a

HARTFORD ECONOMIZER

The air is warmed by a small air stove, which receives its heat from the exhaust manifold. The result is that the engine, fed with an ideal mixture, is smoother running and more powerful. All this is accomplished with an actual saving of 35% in the gasoline hitherto consumed. That's real economy.

Protects While Adding a Touch of Real Style

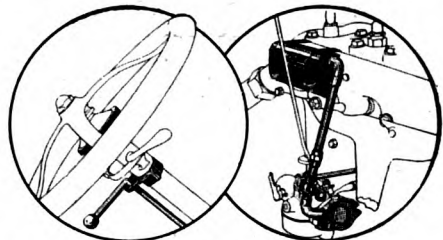
A bumper is a necessity, but it must be dependable. The

HARTFORD BUMPER

is, for it is shock-absorbing. It protects lamps, radiator and mudguards from contact with the colliding body and at the same time takes the force out of the blow. This saves ALL your Ford from damage. Strong, sturdy, beautifying. Not an adaptation for Ford car, but designed especially for it.

Standard Hartford Equipment for Ford cars adds immensely to the pleasure of Ford ownership. You buy with this guarantee—Satisfaction or Money Back.

*We can make any car fit to carry any load over any road
with absolute comfort.*



Hartford Economizer.



Hartford Bumper.

HARTFORD SUSPENSION CO., E.V. HARTFORD, Pres. 147 Morgan St., Jersey City, N. J.

Makers of Hartford Cushion Spring, Hartford Electric Brake, Hartford Auto Jack, Hartford Bumper.

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*Formerly the TruFaulst-Hartford.

COE'S WRENCHES



UNEQUALLED FOR QUALITY THE WORLD OVER

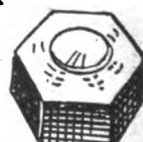
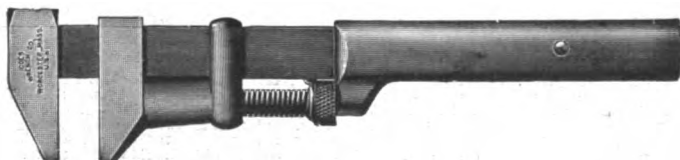
The wrench is the most used and the most useful tool in a motorist's kit.

COE'S Special Automobile Model is a perfect tool. The jaws are hardened special quality tool steel to withstand hard usage, and the handle is long to afford great leverage. The wrench is thin to work in space inaccessible for ordinary wrenches.

Coe's Special Automobile Model wrench is a tool kit in itself. Coe's quality costs slightly more, and it is worth many times the price of any other tool. A Coe's is always dependable, in the garage or on the road. Literature sent at request.

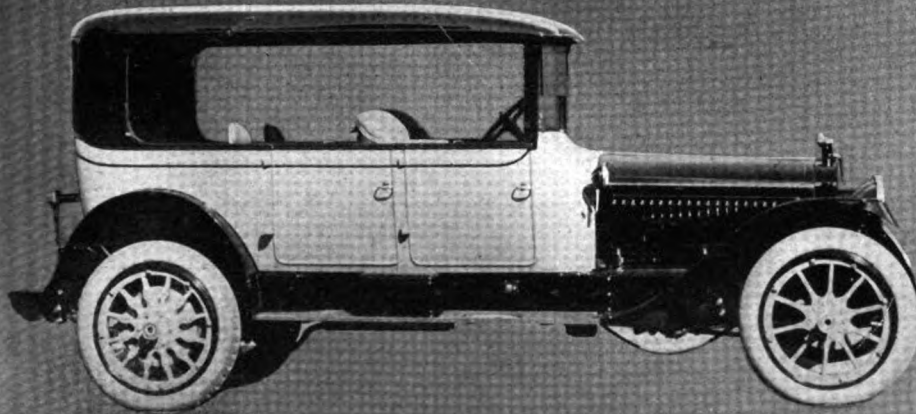
COE'S WRENCH COMPANY WORCESTER, MASS.

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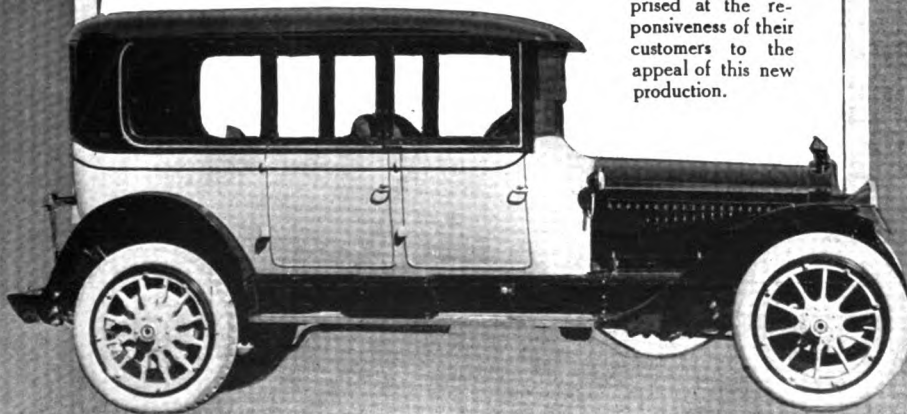
SPRINGFIELD CONVERTIBLE BODIES



THE limousine and the touring car are completely satisfactory only in certain seasons. The new Springfield Demi-Convertible body has no such limitations; it is the all-year, all purpose body.

More and more in America, as in Europe, the tendency is to demand protection from the sun, the dust and sudden showers even in touring. This body with its permanent top provides such protection, while it gives plenty of air and an unobstructed view. It may be converted into a limousine.

Dealers will be surprised at the responsiveness of their customers to the appeal of this new production.



SPRINGFIELD METAL BODY CO.

SPRINGFIELD, MASS.



Cole "Eight" Beats Out the "Empire State"

Under this caption, a full-page advertisement will appear in the Saturday Evening Post for September 4th. Look for it.

And remember, when you read it, that more than 2,000,000 other people will see it—and read it—and talk about it—for it tells of one of the most remarkable feats ever performed by a motor car.

It is just such feats as this, performed by Cole 8's in the hands of owners, that have led hundreds to buy this remarkable car.

Cole 8 is selling on its performance. It is outdemonstrating its rivals everywhere.

That's why our dealers are cashing in on Cole 8—STRONG.

The price of the Cole 8 is \$1785, f. o. b. factory.

Cole Motor Car Company, Indianapolis, U.S.A.

Builders of the Standardized Car

(When Writing to Advertisers, Please Mention The Automobile Journal.)



The Standardized Car

Feats Like These Make Easy Sales

Any Cole Eight Can Duplicate Them

An impromptu brush between the Empire State Express and a Cole 8 took place on May 19, 1915, near Buffalo, N. Y. E. H. Baker, of Buffalo, while on a pleasure trip, accepted the unspoken challenge of the train and won. Not satisfied with this trial, he returned on June 13, prepared for a harder test. He won again. To make a living, positive record of the occurrence, he was accompanied on his second race by a moving picture operator, in another Cole 8, who photographed the two participants in action. The race will be reproduced in the leading picture theatres of the country.

• • •

It was another Cole 8, driven by A. W. Eaton, of Denver, Colo., that made the 320 hazardous miles from Denver to Glenwood Springs, Colo., through the heart of the Rockies, up grades as steep as 22½ per cent. and ranging in altitude from 7,500 to 10,000 feet, in the remarkable time of 11 hours and 50 minutes—2 hours and 10 minutes faster than the regular passenger train schedule. Less than 2 quarts of oil and 22 gallons of gasoline were used for the entire trip.

• • •

A Cole 8 owned by Edgar W. Finn, of Babylon, Long Island, in a trial spin on the Long Island Motor Parkway, showed a speed range in high gear of 1½ to 74 miles an hour with the top and wind-shield down, carrying the driver and three passengers. After running 1,645 miles, Mr. Finn found that only 1 quart of oil and 1½ pints of water had been consumed. Mr. Finn reports an average mileage of 17 miles to the gallon of gas.

Every one of the feats here described was performed by an amateur driver in a Cole 8, out of stock, without any special preparation. Others quite as remarkable are being performed in all parts of the country. They are within the power of every Cole 8 that leaves the factory.

That's why our dealer list is the biggest in our history—why more dealers have been contracted in advance than ever before—why our dealer organization is increasing by leaps and bounds.

Cole 8 makes easy sales because it has the good looks, magnificent road qualities, refinement of appointments, unapproached economy, and more power than you'll find in any other car—bar none. The price of the Cole 8 is \$1,785 f. o. b. factory.

Any territory is virgin territory for a car that performs like the Cole 8, and some of it is still open for the right kind of dealers. Write us today for our proposition.

Cole Motor Car Co., Indianapolis, U. S. A.

Builders of the Standardized Car.

Index to Advertisers.

	Page
Ahlberg Bearing Co.....	60
Barrett Manufacturing Co....	63
Bosch Magneto Co.....	57
Boyd, F. Shirley.....	58

Coes Wrench Co.....	2
Cole Motor Car Co.....	4-5
Culver Stearns Mfg. Co.....	58

Dixon Crucible Co., Jos.....	63
------------------------------	----

Eagle Oil & Supply Co.....	6
Eisemann Magneto Co.....	62

Goodyear Tire & Rubber Co....	59
-------------------------------	----

Harris Oil Co., A. W.....	60
Hartford Machine Screw Co.....	Cover
Hartford Suspension Co.....	1
Heinze Electric Co.....	56
Hotel Tuller.....	62

Inter-State Motor Co.....	56
---------------------------	----

Marburg Bros.....	57
McQuay Norris Mfg. Co.....	63
Mea Magneto Co.....	57
Mecca Mfg. & Spec. Co.....	6
Metz Company.....	59

New Departure Mfg. Co.....	56
Nordyke & Marmon Co.....	59
Norman Garment Co.....	62
N. Y. & N. J. Lubricant Co....	63

O-Zel-O Co., The.....	57
-----------------------	----

Peerless Motor Car Co.....	57
Picard Co., A. J.....	Cover
Pierce Arrow Motor Car Co.....	Cover

Scripps-Booth Co., The.....	55
Splitdorf Electrical Co.....	58
Springfield Metal Body Co....	3
Standard Oil Co., The.....	61
Standard Woven Fabric Co.....	Cover

Staybestos Mfg. Co., The.....	60
Stutz Motor Car Co.....	7
Superior Mfg. Co.....	58

Texas Oil Co.....	11
Thermoid Rubber Co.....	56
Times Square Automobile Co..	6
Tuller Hotel.....	62

Valvoline Oil Co.....	60
Vanderpool Company, The....	3

Weed Chain Tire Grip Co....	12
-----------------------------	----

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**Shop Vulcanizer, Bargain.
Vanderpool, Springfield, O.**

TIMES SQUARE AUTO CO. WORLD'S LARGEST DEALERS

In Automobiles, Accessories and Supplies.
Selling Prices Lowest in the World. Send
for our Latest Price Wrecker and Save
Money.

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NEW YORK CHICAGO

**DEALERS, GARAGE MEN and
AUTOMOBILE AGENTS—**
To make money nowadays you
must buy cheap. We sell supplies
cheaper than any concern in the world.
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NEW YORK CHICAGO

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Each Monthly Issue

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in Its Field**

Detailed Advertising Information
at Request

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NO-KARBON EAGLELINE AUTO OIL

THE OIL THAT SUITS
AND DOES NOT SOOT.

Carbon in your cylinders means loss
of power. Customers report 10,000
to 15,000 miles with no carbon troubles.
A good motto: TRY ANYTHING
ONCE. EAGLELINE NO-KARBON
AUTO OIL is furnished in 1.5-10
gallon, 30 and 50 gallon Steel Drums
with faucets for which no extra charge
is made.

**EAGLE OIL
AND SUPPLY CO.**

104 BROAD STREET, BOSTON, MASS.



STUTZ

ANNOUNCES

SERIES "C" MODELS

Nothing Spectacular—Four Cylinder Only
Simplicity—Consistency—Stability

The Accomplishment of An Ideal

Bearcat \$2,000

Roadster \$2,100

Bulldog \$2,250

Touring - \$2,300

Bulldog Special \$2,550

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Stutz Motor Car Company
Indianapolis, Indiana

AMERICA'S IDEAL CAR

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Buyers' Reference and Guide.

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Auto Parts Co., Providence, R. I.
Faw, J. H., Inc., 41 Warren St., New York City.

Motor Parts Co., 185-187 Columbus Ave., Boston; 818 No. Broad St., Philadelphia; Springfield, Mass.

Times Square Auto Co., 56th St., at Broadway, New York City.

AIR COMPRESSORS AND TANKS.

Brunner Mfg. Co., Main Office and Factory, Utica, N. Y.; New York Office, Hudson Terminal Bldg., 30 Church St. (Brunner.)

Williams Foundry & Machine Co., Akron, O.

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Gemco Mfg. Co., 743 So. Pierce St., Milwaukee, Wis.

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AUTOMOBILE SPECIALTIES.

Motor Specialties Co., Waltham, Mass.

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Russel Motor Axle Co., North Detroit, Mich. (Internal Gear Drive.)

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Ahlberg Bearing Co., 2624 Michigan Ave., Chicago; 1790 Broadway, New York City; 805 Woodward Ave., Detroit.

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Marburg Bros., Inc., 1790 Broadway, New York. (S. R. O.)

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Springfield Metal Body Co., 20 Medford Ave., Springfield, Mass.

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Standard Woven Fabric Co., Framingham, Mass. (Multibestos.)

Staybestos Mfg. Co., Lena and Armat Sts., Germantown, Philadelphia, Penn. (Staybestos.)

Thermold Rubber Co., Trenton, N. J.

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Williams Foundry & Machine Co., Akron, O.

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Alr-Friction Carburetor Co., Dayton, O. (Model C.)

Zenith Carburetor Co., Detroit. (Zenith.)

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Inter-State Motor Co., 804 West Willard St., Muncie, Ind. (Inter-State.)

Metz Co., Waltham, Mass. (Metz.)

Nordyke & Marmon Co., Indianapolis. (Marmon.)

Peerless Motor Car Co., Cleveland, O. (Peerless.)

Pierce-Arrow Motor Car Co., Buffalo, N. Y. (Pierce-Arrow.)

Scripps-Booth Co., Detroit. (Scripps-Booth.)

Stutz Motor Car Co., Indianapolis. (Stutz.)

White Co., Cleveland, O. (White.)

Willys-Overland Co., Toledo, O. (Overland.)

Winton Motor Car Co., 131 Berea Road, Cleveland, O. (Winton.)

CARS—GASOLINE COMMERCIAL.

Bessemer Motor Truck Co., Grove City, Penn. (Bessemer.)

Chase Motor Truck Co., 106 West St., Syracuse, N. Y.

Duplex Power Car Co., Charlotte, Mich. (Duplex.)

Federal Motor Truck Co., Junction and Leavitt Sts., Detroit. (Federal.)

General Motors Truck Co., 26 Cadillac Ave., Pontiac, Mich. (GMC.)

Independent Motors Co., Port Huron, Mich. (Independent.)

Jeffery Co., Thos. B., Kenosha, Wis.

Kissel Motor Car Co., 196 Kissel Ave., Hartford, Wis.

Packard Motor Car Co., Detroit, Mich.

Peerless Motor Car Co., Cleveland, O. (Peerless.)

Pierce-Arrow Motor Car Co., Buffalo, N. Y. (Pierce-Arrow.)

Sanford Motor Truck Co., Syracuse, N. Y. (Sanford.)

Signal Motor Truck Co., Detroit. (Signal.)

Sullivan Motor Car Co., Rochester, N. Y. (Sullivan.)

White Co., Cleveland, O. (White.)

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General Motors Truck Co., 26 Cadillac Ave., Pontiac, Mich. (GMC.)

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CHAIN LUBRICANTS.

Motor Accessories Inc., 749 A Boylston St., Boston. (Chain-Lub.)

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Weed Chain Tire Grip Co., 28 Moore St., New York. (Weed.)

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King Specialty Co., Brookline, Mass. (King.)

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FORD STARTERS.

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Lovell-McConnell Mfg. Co., Newark, N. J. (Klaxon.)

Sells Mfg. Co., 444 Dorr St., Toledo, O.

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Faw, J. H., Inc., 41 Warren St., New York City.

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Packard Electric Co., The, Warren, O.

JACKS.

Motor Specialties Co., Waltham, Mass. (Excel Auto.)

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Faw, J. H., Inc., 41 Warren St., New York City.

Mabey's Electric & Mfg. Co., Indianapolis. (Mabey's Electric Trouble.)

Mueller & Co., R. S., 431 High Ave., S. E., Cleveland, O. (Clamp.)

LIGHTERS, CIGAR.

Mabey's Electric & Mfg. Co., Indianapolis. (Mabey's Electric.)

THE AUTOMOBILE JOURNAL.

BUYERS' REFERENCE and GUIDE—Continued.

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Faw, J. H., Inc., 41 Warren St., New York City. (Lennon.)

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Continental Asbestos Corp., Worcester, Mass. (Spedolene.)

Dixon Crucible Co., Jos., Jersey City, N. J. (Graphite.)

Eagle Oil & Supply Co., 104 Broad St., Boston. (Eagleine No-Karbon.)

Harris Oil Co., A. W., 326 So. Water St., Providence, R. I.; 143 No. Wabash Ave., Chicago. (Harris.)

New York & New Jersey Lubricant Co., 165 Broadway, New York. (MotoRol, Non-Fluid, Kejex.)

Standard Oil Co., New York. (Polarine.)

Texas Company, 17 Battery place, New York City. (Texaco.)

Vacuum Oil Co., Rochester, N. Y. (Gargoyle Mobiloil.)

Valvoline Oil Co., 27 State St., Boston. (Valvoline.)

MAGNETO COVERS.

Heinze Electric Co., Lowell, Mass.

MAGNETOS AND SUPPLIES.

Bosch Magneto Co., 223-225 W. 46th St., New York.

Eisemann Magneto Co., 32 33d St., Brooklyn, N. Y. (Eisemann.)

Marburg Bros., 1790 Broadway, New York. (Mea.)

Motor Parts Co., 818 No. Broad St., Philadelphia, Penn.

Splitdorf Electrical Co., 98 Warren St., Newark, N. J.

MAILING LIST.

Trade Circular Addressing Co., 166 W. Adams St., Chicago.

MEASURES.

Dover Stamping & Manufacturing Co., Cambridge, Mass. (Auto and Savol.)

MOTORS.

Auto Parts Co., Dept. T, 737-739 W. Jackson Blvd., Chicago, Ill. (Michigan.)

Wisconsin Motor Mfg. Co., Milwaukee, Wis.

PISTON RINGS.

McQuay-Norris Mfg. Co., Dept. D. St. Louis, Mo. (Leak-Proof.)

PRESSES. (See Arbor Presses.)

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Hill Pump Valve Co., Chicago, Ill.

RADIATOR CEMENT. (See Cements.)

RADIATOR & HOOD COMBINATIONS.

Superior Lamp Mfg. Co., 136 W. 52nd St., New York, N. Y.

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RINGS. (See Piston Rings.)

ROAD BUILDING MATERIALS.

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ROLLER BEARINGS.

Hyatt Roller Bearing Co., Detroit. (Hyatt.)

Norma Co. of America, 1790 Broadway, New York City. (Norma.)

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SELF-STARTERS. (See Motor Starters.)

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SPRINGS FOR AUTOMOBILE SUSPENSION.

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Lane, Will B., 180 No. Dearborn St., Chicago. (Unique Ratchet.)

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Walden Mfg. Co., 73 Commercial St., Worcester, Mass.

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August, 25, 1915.

NO. 2.

PUBLISHER'S AND READERS' PAGE.

THE Publisher Announces with regret in which a pardonable amount of pleasure is mixed, that the extra large edition of the Touring Number of The Automobile Journal (issue of July 10, 1915) is entirely exhausted. Consequently, it is now impossible to obtain copies of that issue. This announcement is actuated by the fact that hundreds of requests for that number continue to arrive in his daily mails. Just as an indication of the popularity of the Touring number it might be stated that 4500 extra copies were printed against the certainty that there would be a demand for them. This demand, however, far exceeded the publisher's most sanguine expectations, which fact, while causing him to regret his inability at this time to fill all orders arriving at this late date, also is a source of pleasure, in that it is certain proof that The Automobile Journal has a firm position in the hearts of the motoring public.

Congratulatory Letters anent the Lighting and Starting System series are beginning to arrive. Without exception they endorse the manner in which this discussion is being conducted and urge that it be continued until the last detail has been explained. This will be done. All systems will be described and their principles of construction, operation and installation will be explained, so that at the conclusion of the series there will be available a complete library of information on the subject of Motor Starting and Car Lighting. The Editor urges that the subscribers save their copies in which the installments appear. They will form a valuable compendium of information on the subject, which could not be duplicated unless at a comparatively prohibitive cost.

J. Harry Minor Presents in this number another incomparable TIB tour. He takes the reader through the Petrified Forest in imagination and paints a vivid picture of the wonders to be seen. Having travelled the route himself in the official Touring Information Bureau car, he knows whereof he speaks, and conse-

quently his facts and data are unquestionable. The third TIB tour will appear in an early issue.

The Touring Department has been exceedingly busy this month in supplying touring information direct to inquirers. The Touring Editor's sources are so complete that he has been able to do this with a minimum of time and with a maximum of accuracy.

The inquiries indicate that more touring is being done this season than ever before, and that the trips are planned for longer distances than formerly. Probably the longest interstate trip for which information was requested in August was from New York City to Covington, Ky. The desire to visit places of historical interest seems to be uppermost. One inquiry was for information as to the route from Boston, through Plymouth, along the Cape Cod Canal, through Onset, Providence, Narragansett, Newport, New London, and New Haven to Bridgeport. The owner planning this trip intended to "stick to the shore as closely as road conditions will allow, visiting the places worth while." This department is open to all subscribers who desire touring information, for which no charge is made.

Suggestions for the Ford Car Owners continue to be of surpassing interest and value to the readers of the department bearing that name. The 30th article of the series appears in this issue, which brings to mind the query, "Are you saving these articles?" If not, you are missing an unusual opportunity to obtain a complete and exhaustive instruction book on the care, repair and operation of the Ford car. The series offers more than that—it

affords a "technical school course" in the mechanical principles that enter into the making of automobiles and their equipments.

The Editor Says, "Read the correspondence in the New Owners department. Therein you may find the solution to the problem that it is troubling you. If you do not, send in your query.

Partial Table of Contents.

	Page.
*The Petrified Forest of Arizona.....	13
*Stutz Makes Clean Sweep at Elgin.....	18
*Overland Model 86.....	21
*Genemotor Equipment for Ford Cars.....	23
*General News of the Industry.....	27
*Practical Motor Car Repairs.....	31
*Motor Starting and Car Lighting.....	33
*Armies Prefer Gear Driven Trucks.....	38
*Car Accessories and Equipment.....	39
*McFarlan Six, Series T and X.....	41
*Suggestions for the Ford Car Owners.....	44
Coffin and Riker On Navy Board.....	47
Survey of Road Making Materials.....	48
*Ford Car Accessories and Equipment.....	49
*Industrial Happenings and Comment.....	51
Road Congress Programme.....	52
*Practical Facts for New Car Owners.....	54

*Indicates that article is illustrated.

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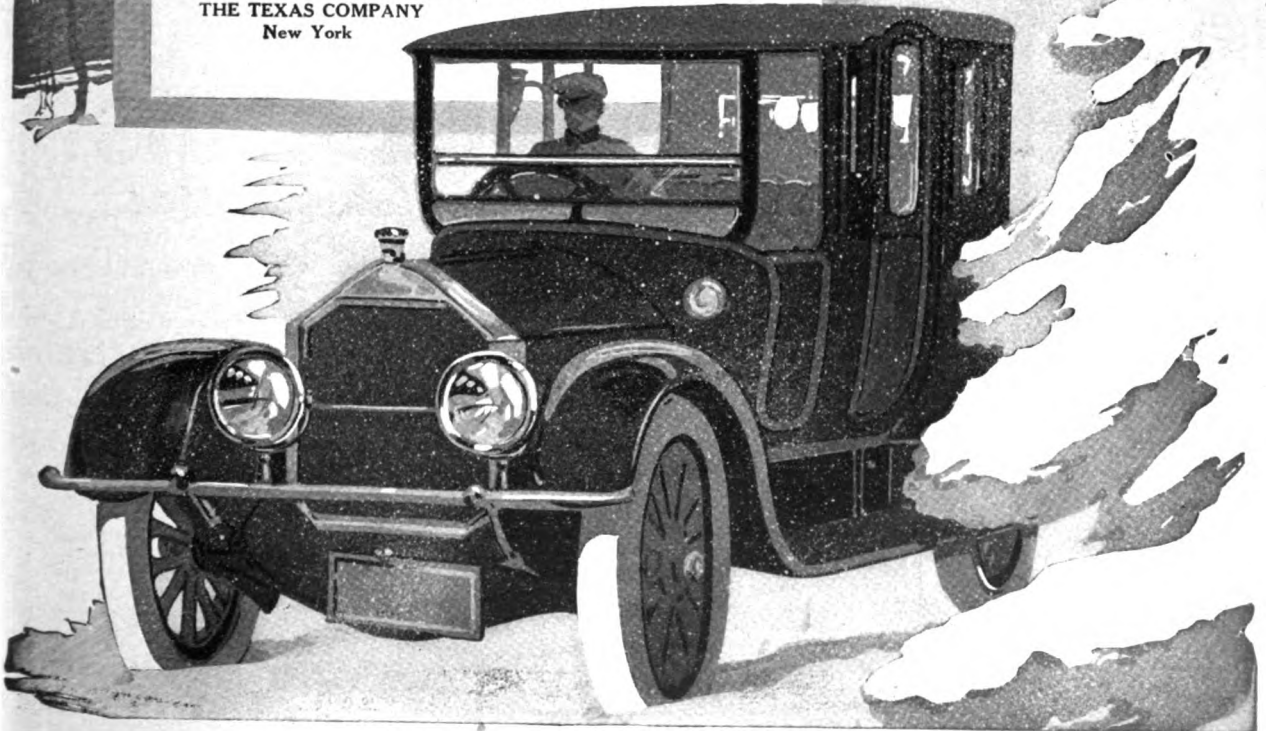
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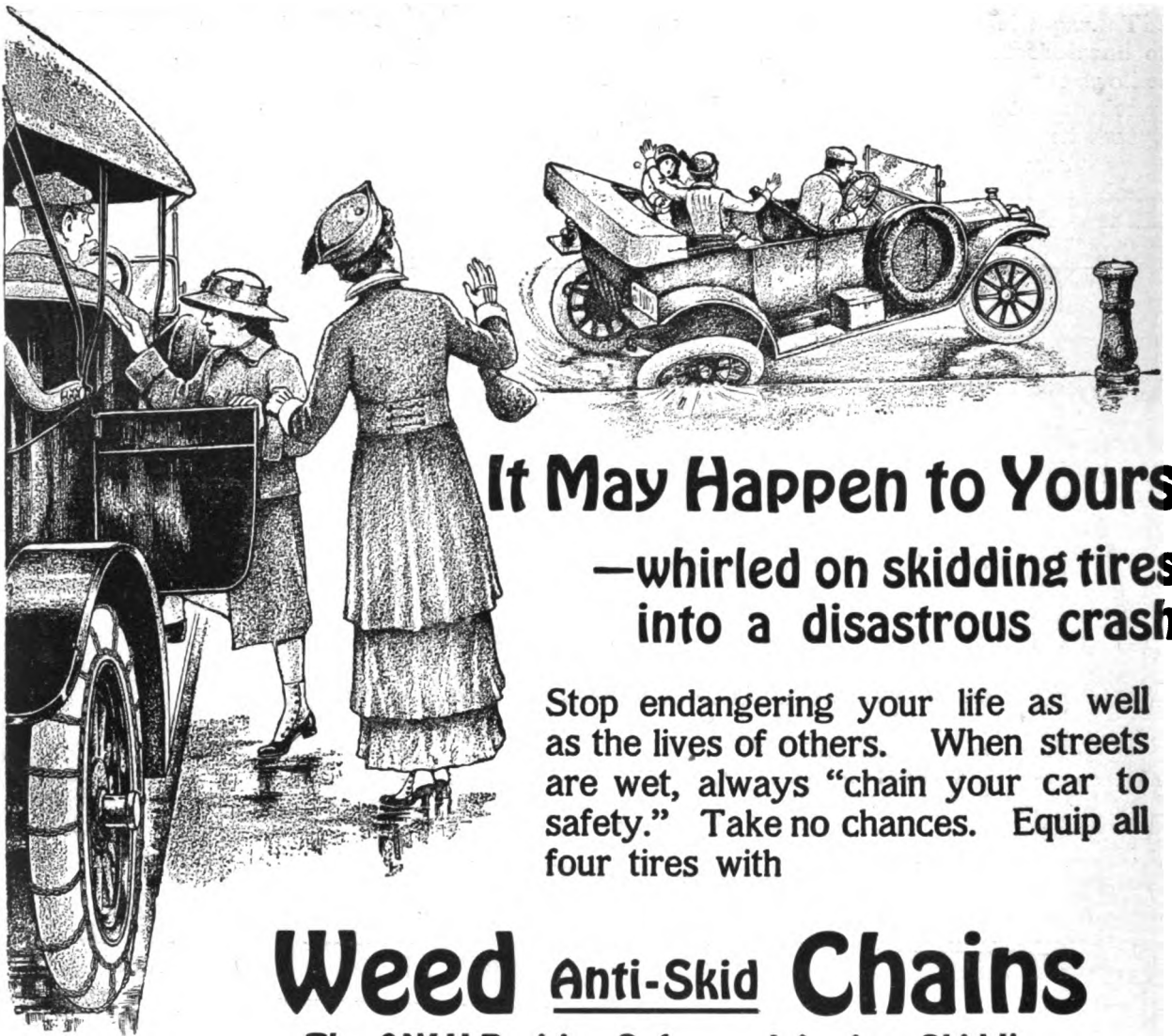
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THE AUTOMOBILE JOURNAL

VOL. XL, No. 2

AUGUST 25, 1915

Price, \$1.50 the Year

THE PETRIFIED FOREST OF ARIZONA.

One of the Natural Marvels of the World Is Found in the Great Trees That Have Been Turned to Sparkling Stone by the Chemistry of Time.

ATTRACTED by the beauty, oddity and antiquity which comprise the scenic interest of the great western country, so recently thrown open by the improvement of roads, and by the great Panama-Pacific exposition, the eyes of the touring world have this year turned westward as they never have before.

A strikingly large proportion of the requests for aid reaching the Touring Information Bureau of America have to do with far western travel, especially with the southwest. The greatest interest has been shown in that part of the trip west of St. Michaels, Ariz.

St. Michaels is an Indian trading post on the Santa Fe trail. The Franciscan Fathers maintain a mission there and they may be counted upon to extend a friendly hand of welcome to any traveller passing that way.

Two miles from St. Michaels is a cliff dwelling of great

antiquity and in so good a state of preservation that it is well worth a side trip from the town to see. Then, leaving St. Michaels, a good road will be found running north through the Wide Ruins and Navajo past Bito station to the great petrified forest.

This lies between Adamana and Holbrook and its centre is traversed by the transcontinental route, which is logged in the TIB Automobile Route Book.

Here thousands of gigantic tree mummies, some many feet in length, but the greater part broken into sections and fragments of every shape and size are scattered about in great confusion.

Nature working through countless ages has wrought a wonderful transformation in these massive forms. All the delicate fiber and grain of the wood has been retained, while the substance has been changed to chalce-



Petrified Forest of Arizona—Photograph from the Santa Fe Ry.



Ancient and Picturesque Pueblos of the Hopi Indians.

usually with a wierd dance or pageant.

Foremost among their ceremonial dances are the Flute and Snake dances. The first is impressive and beautiful and the latter startling, owing to their employment of venomous rattle snakes as grim accessories to their rites. Both dances are intended as supplications to the gods for rain.

It is said that the Indian priests possess a secret antidote for snake bites—other than the recognized pale faced remedy—and that occasional bites received from the reptiles during the ceremonies never have serious consequences.

The Hopis pride themselves on their peaceful disposition, rather than their warlike achievements, and they receive with cheerful hospitality all visitors who treat them with courtesy. Their ceremonial affairs are free to all who care to attend.

An incident of the drive between Holbrook and Winslow is the bridge crossing Chevelon Chasm, a mere scratch on the face of the earth as canyons go in Arizona, but, nevertheless, about 65 feet wide and 150 feet deep. At the bottom of the gorge is Chevelon creek, one of the streams of the vicinity that has been put to use for irriga-

tion purposes recently.

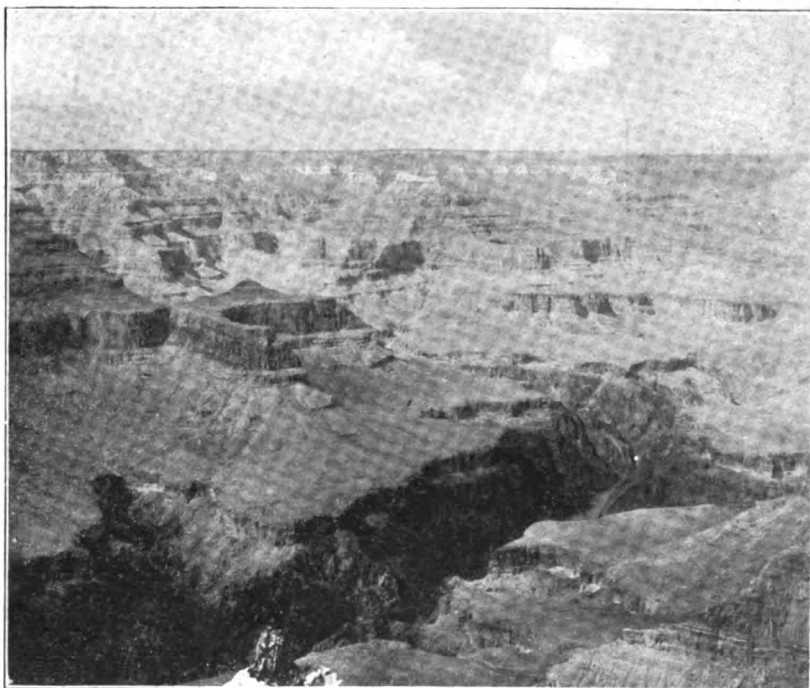
From Holbrook west the route closely follows the Little Colorado river to Aztec ranch, where there is a telephone station. Through the settlement of Coral a splendid road crosses Chevelon creek, over a new steel bridge, and on westward to Winslow, where excellent tourist accommodations can be had. There is a good road, too, through Moqui and across the Canyon Diabolo, which is crossed on a massive concrete bridge. A short distance to the left of this bridge is the famous Meteor Crater.

This is a great pit in the desert, three miles in circumference and surrounded by a rim or talus 150

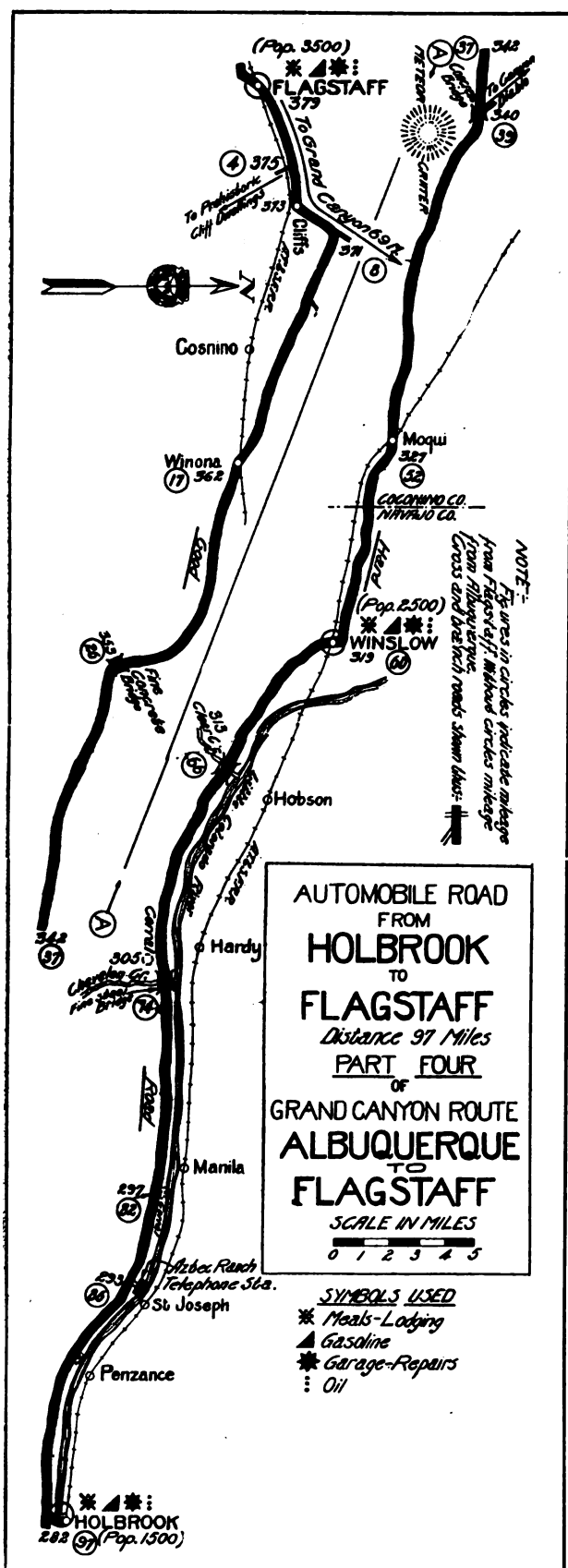
feet high. From the top of this rim to the bottom of the crater is 600 feet deep. The encircling rim is almost perfectly round.

This great hole in the earth was caused by a gigantic fragment thrown off by a neighboring planet and hurled at the earth with such force that it penetrated the surface for 1100 feet, where parts of it still lie.

Pieces of meteoric iron litter the ground for



Grand Canyon of Arizona—Photograph from the Santa Fe Ry.



miles about the huge pit. Under hundreds of feet of pulverized rock, cinders and sand lies the mighty mass of nickelled meteoric iron studded with black diamonds. The presence of the mass has been proved by borings with a diamond pointed drill, which found the mass and wore off its diamond point against its impenetrable surface. That is as far as investigation of this mystery has progressed.

The borings were made by Professor Holsinger, who was financed by Philadelphia capitalists. Since his death nothing has been done to secure fuller information regarding the meteor.

From this point the road continues to Flagstaff, a city of many interesting features, which stands in the midst of the largest pine forest in the United States, a government reserve.

For the motorist, angler and hunter, Flagstaff offers the maximum of attraction. The great surrounding forest is more like an extensive park than a tree-choked wilderness. Game and fish find the region as congenial as do those who come to seek them.

Fifteen miles south of Flagstaff, on a remarkably fine road through the pines, is Oak Creek canyon. Oak creek runs through the ravine and in its waters are some of the finest trout that can be found in America. If black bass fishing is preferred it can be had at Lake Mary, a beautiful sheet of water a few miles from Flagstaff, where fishing and bathing are also available. A few miles west of Lake Mary is Rogers lake, overgrown with aquatic vegetation and a paradise for the duck hunter. Both lakes are readily reached by motor car.

Everyone who reaches Flagstaff will wish to see Walnut canyon. For in it there are thousands of prehistoric cliff dwellings in an excellent state of preservation. The canyon is 10 miles from the city and is reached over the best of motor roads. This is one of the most accessible of the ancient cities of the cliff dwellers in Arizona and was for many years a favorite with amateur archeologists, who carried away so much pottery that the government made the place a national reserve and placed soldiers in charge of it, to prevent the taking away of anything found there.

For those who enjoy mountain climbing, there is a delightful trip to the summit of Humphrey's mountain, one of the San Francisco peaks, which can be made both ways from Flagstaff in one day. Although the way is delightfully picturesque and easy, with few of the hardships often associated with mountain climbing, the view is one of the finest in America, commanding a territory of 75,000 square miles.

Some objects 200 miles away can be seen with sufficient distinctness to be identified. Within a distance of 50 miles, in which lie portions of the Grand Canyon, the Little Colorado river, lava beds, volcanic craters and Oak Creek canyon, the landscape seems almost at the feet of the beholder.

Without taking a step the tourist may stand on the summit of Humphrey's peak and enjoy a bird's eye view of every type of interest that Arizona has to offer—canyons, mountains, streams, lakes, arid deserts, fruitful farms, lava beds, prehistoric ruins, Indian pueblos, forests, cities, mesas and painted plateaus—marvelous specimens in the great natural museum that will one day make Arizona a great mecca for sightseers.

This trip through Arizona is only one section of the TIB Automobile Route Book that is now in its third edition. It connects this route with the main travelled highways of the country. The new edition includes three complete transcontinental routes, as well as one from the Great Lakes to the Gulf of Mexico.

STARTING AND LIGHTING FIGURES.

Of the 611,000 cars produced in America last year 261,860 were equipped by their makers with electric starting and lighting systems, according to G. Brewer Griffin, manager of the automobile equipment division of the Westinghouse Electric & Manufacturing Company of Pittsburg.

According to his figures, at an average dealers' value of \$621.50 per car, the total output was worth \$380,000,000. The total value of the electrical equipment is given as \$10,354,570.

AUTOMOBILE INSURANCE RATE WAR.

The New Jersey Fidelity and Plate Glass Insurance Company has entered the field of automobile liability insurance and has issued a schedule of rates for the business in New Jersey which is from \$1 to \$14 lower than that of the old line companies who are members of a rate conference on cars under 30 horsepower and \$14 under the conference rates on cars over 30 horsepower.

To retaliate, one of the large companies in the conference immediately announced a reduction of 50 per cent. on plate glass premiums in New Jersey where the New Jersey Fidelity and Plate Glass Insurance Company collects \$45,000 annually in plate glass premiums. The war on plate glass rates may be extended to Illinois, where the New Jersey company has a large volume of business. The other companies are seek-

ing to avoid a rate war on automobile rates to as large an extent as possible.

MOTOR CAR INCREASES LAND VALUES.

Large recent increases in farm and ranch values in Texas are credited in part by bankers and real estate men to the development of the motor car, which has reduced the running time between towns and farms and has made life on the plains much more livable.

The values of Texas lands have, of course, gone up rapidly from other causes, but the experts estimate that the increase due to motor cars has been as high as \$15 per acre in some cases and that it probably averages \$5 an acre all over the state. This would make a total increase in value credited to the motor car of \$840,000,000.

SIGN POSTS FOR OLD TRAILS ROAD.

Signs marked "Danger, Sound Spartan" have been placed along the Lincoln Highway by the Sparks-Withington Company, Jackson, Mich. The car used in erecting the signs has reached the Pacific Coast and will return marking the National Old Trails Road as far as Philadelphia.

Forty cars equipped with various kinds of dimming devices were recently tested out at the Boston Country club by Col. Sohler of the Massachusetts State Highway Commission and committees of various automobile organizations. As a result of the tests recommendations will be made to the state legislature regarding headlight legislation.

The Automobile Dealers Association at a recent meeting decided to support the probe launched with the purpose of determining why Buffalo (N. Y.) motorists pay 15 cents a gallon for gasoline when it is sold in Detroit and other cities for 10 cents.

Members of the Automobile Club of America are planning to procure a fleet of armored motor cars for use by the United States Army in case of war. As soon as the club has acted on the matter it will be brought before Major General Leonard Wood for official consideration.

The city of Philadelphia has appropriated \$500 to mark the streets upon which the Lincoln highway passes through the city.

STUTZ MAKES A CLEAN SWEEP AT ELGIN.

STUTZ cars took first and second places in each of the 300-mile races run on the Elgin Ill., course, Aug. 20 and 21. In the first race Earl Cooper took first place with his team mate Anderson second. In the second race Anderson was first with Cooper second. Cooper's time broke the record for the course, and Anderson bettered that by about three miles an hour. There was much delight among the fans who saw the race over the fact that American cars with American drivers had decisively beaten foreign cars and foreign drivers.

The course over which the race was run is



Earl Cooper, Victor in First Day's Race at Elgin, and Near-Winner on Second Day.

slightly more than 301 miles. It was in exceptionally good condition this year. The first day's race was for the Chicago Automobile Club trophy, with prizes of \$2000 for first place and \$625 for second. The second day's race was for the Elgin national trophy with prizes of equal amount.

In the race for the Chicago cup, Cooper covered the 302 miles in 4:01.32; at an average of 74.97 miles per hour. This was considerably better than De Palma's record, made in 1914 with his grand prize Mercedes, which he again drove this year. His winning time had been 73.86 miles.

Gil Anderson, in another Stutz, followed his team mate across the line, making the run in

4:05.12, at an average of 73.86 miles per hour. Oldfield, whose Delage had shown poorly in the 100 mile invitation race at the Chicago track, had his car in good shape and took third. Alley, in an Ogren, was fourth, and O'Donnell, in a Duesenberg, was fifth. This was Cooper's first race on the course.

The race was spirited from the start. De Palma's Mercedes developed mechanical trouble early in the grind. In the sixth lap De Palma stopped for adjustments and did not get started again until the other drivers were 16 laps ahead. At 176 miles he had more trouble and then withdrew from the race.

Rain made the second day's racing dangerous in several places on the track. But the familiarity with the course gained the day previous made it possible for the drivers to make much better

Results, Aug. 20.

	Time.	M.P.H.
1—Cooper, Stutz.....	4:01.32	74.97
2—Anderson, Stutz.....	4:05.04	73.85
3—Oldfield, Delage.....	4:09.55	72.46
4—Alley, Ogren.....	4:14.29	71.16
5—O'Donnell, Duesenberg.....	4:15.40	70.83

Results, Aug. 21.

	Time.	M.P.H.
1—Anderson, Stutz.....	3:54.25	77.25
2—Cooper, Stutz.....	3:57.29	76.25
3—O'Donnell, Duesenberg.....	3:59.01	75.76
4—De Palma, Mercedes.....	3:59.16	75.69
5—Oldfield, Delage.....	Did not finish.	

time. Anderson covered the course in 3:54:25:87, or at a speed of 77.25 miles per hour. Cooper, who finished second, also broke his own record of the day before, maintaining a speed of 76:25 miles per hour.

De Palma, whose car this time stayed in the race to the finish, made the fastest lap of the day, covering one turn of the track at a speed of slightly better than 80 miles per hour. O'Donnell, in a Duesenberg, finished third at a speed of 75.76 miles per hour, and De Palma, last year's winner, fourth at 75.69. Oldfield's Delage failed to finish.

Buzaine's De Deitrich was taken out on the first lap with a broken crankshaft. Burt's Stutz was withdrawn because of a sticky valve. Henderson's Duesenberg was eliminated by a cracked timing gear.

NEW WORLD'S RECORD.

By covering 25 miles on a half-mile track at Worcester in 33 minutes and 59 seconds, Arthur

Klein recently set a new world's record. The previous record had been made only a week before by Bob Burman at Rock Island, Ill., who made the distance in 38 minutes and 25 seconds. Klein made two stops, losing about 30 seconds of very valuable time.

VINCENT ASTOR DONATES CUP.

Announcement has been made by the Sheepshead Bay Speedway Company that a perpetual challenge trophy has been donated by Vincent Astor, to be raced for Oct. 2, when the 350-mile race, for which cash prizes of \$50,000 have also been provided, will be run off.

The offer of the Astor cup has intensified the interest of New York society in the event and about one-fourth of the box seats at the new plant have already been sold. Orders for seats have come from as far North as Portland, Me., and as far West as Denver. The ticket office at 1696 Broadway, New York City, was opened Aug. 21.

Work on the speedway is now practically completed and is far ahead of schedule. The grandstand will be completed by the time of the elimination trials. The double-deck steel stand has, by a novel arrangement, been adapted for use at aviation meets, permitting the occupant of every seat an unobstructed view of the sky and still protecting him from the rain.

ROBERTSON MAY RACE.

George Robertson, who has not raced since 1909, has announced that if the car comes up to expectations he will drive in the 350-mile Sheepshead Bay race a foreign production which is being imported for the event by Walter Allen. Robertson won the Vanderbilt cup two years in succession, two Fairmount park road races, a 24-hour race at Brighton Beach, the Lowell road race in 1908 and made numerous world's records at Ormond and Daytona Beach. Since his retirement he has been in the selling end of the automobile business and is now manager for the Houk wire wheel in New York City.

BRISCOE TO ENTER RACING FIELD.

While very little information has been given out concerning the design or type of the cars that are being built for racing purposes, it is announced that the Briscoe Motor Company, Jackson, Mich., is preparing three cars to be entered

as a team in race meets this fall.

The Briscoe factory is the only one which is known at present to be working on new racing models, and much interest has been shown in the cars. The owners of the many new automobile racing speedways welcome additional competitors on their tracks.

The first appearance of the new racers will be at Cleveland, where they will begin their career in the track races that are to be a feature of the Forest City fair.

It is said that the cars are equipped with light but powerful engines, with light frames and light pistons. In this respect they follow in a general way the principles used in Briscoe stock cars. The cars have been designed chiefly for use on



Gill Anderson, Winner of Second Day's Contest at Elgin, and Who Established New Record for the Course.

dirt tracks and the smaller speedways and without particular reference to events on the big tracks.

R. E. Donaldson, Milford, Ia., designer of the Emden car, which contested in the Indianapolis races, was instantly killed during a race at Spirit Lake, Ia., Aug. 13. His mechanic was so seriously injured that he will probably die. The two sons of Mr. Donaldson won first and second places in the race.

As a result of deaths in the recent races at Des Moines, a number of New England papers have been engaging in an agitation to prohibit automobile racing.

URGES GOOD ROADS FOR FARMERS.

"According to a recent report of the Department of Agriculture the farmers of the United States are losing \$250,000,000 annually because of bad roads," says A. O. Dunk, president of the Detroit Motor Car Company. "The loss arises from the fact that bad roads prevent their getting their product to market at the time when prices are best.

"The motorist has been an important factor in the rapid improvement of roads in the country, his influence having extended even to Congress itself. It becomes the duty of farmers everywhere to lend their influence in equal measure to the building of good roads.

"See that the legislator who represents your district is a good roads advocate. Get up petitions in your county and incorporate them into one monster petition, addressed to your legislature and governor demanding enactment of good roads laws with adequate appropriations.

"Concerted action in this connection is bound to have results that in a few years will add 10 billions to the wealth of the farmers. Such an increase in farm wealth will add greatly to the prosperity of the whole country and for that reason, I as one manufacturer, will at all times lend every influence in my power to help the construction of good roads."

TWO TRAIN LOADS OF CARS DAILY.

Shipments of 1916 cars from the Studebaker plants in Detroit to its branches are being made at the rate of two train-loads per day. Although production was for a time slowed down by the change from the old to the new models it has now reached a point where every day the number of cars completed is greater than for the biggest days of the last year, and the rate of production continues to increase.

The train loads shipped to the branch houses are distributed among the dealers tributary to those branches and other shipments of considerable size are made to dealers who do business directly with the factory.

Reports reaching Sales Manager L. J. Ollier direct from the branches indicate no slowing up of sales, which have developed in unexpected volume on the new and larger car at a lower price. An unprecedented production for the year is indicated. A new building under construction at plant No. 3 in Detroit will furnish 100,000 additional square feet of floor space, which will be used for the enameling and steel

stamping departments and will be equipped with some new and highly efficient machinery.

TAPE MEASURES FOR CAR SALESMEN.

Something new in sales helps is the 48-inch tape measure in an ornamental white case which has just been distributed to salesmen for Inter-State cars. The company wishes to have the ample dimensions of Inter-State bodies, their leg room, and comfort arrangements pointed out to prospective buyers.

The idea is that during his sales talk the salesman shall pull out his ornamental tape measure and give the prospect the exact dimensions of the riding spaces. Although the wheelbase of many modern cars appears small by previous standards, methods have been found to mount bodies on these chassis which have ample room to provide riding comfort. Yet many buyers have formed the habit of gauging body room on a basis on wheelbase and the Interstate company believes its novel sales help will be useful in breaking down that mistaken idea.

DETACHABLE TOPS FOR KING EIGHTS.

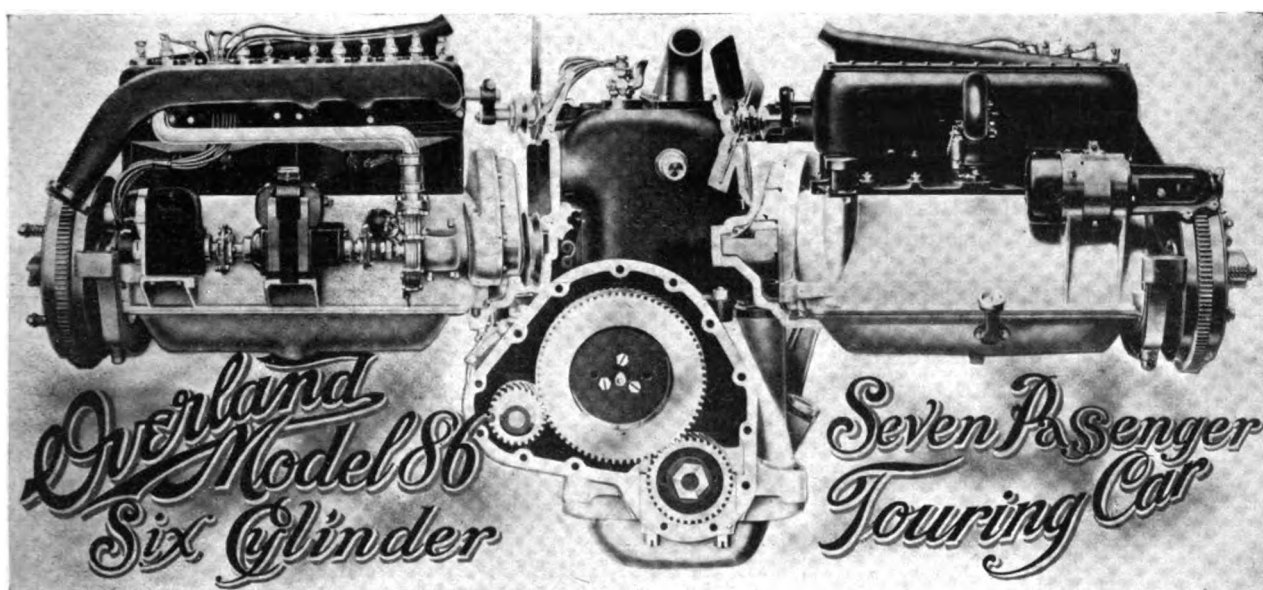
A plan for supplying King "Eights" with detachable Sedan tops, on which the only margin made will go to the King dealers, has been worked out by General Manager Vollbrecht of the King Motor Car Company.

Orders have been placed with a top manufacturer for the probable number of these tops to be required by King dealers and a quantity price has in that way been secured. The King company will furnish to dealers only one car with that type of body for demonstration purposes and further orders for the top will be placed by the dealer direct with the top company.

Ordinarily such a top adds about \$250 to the price of a car, but it will be possible to sell the \$1350 King "Eight" equipped with such a top to the customer for \$1500. The top gives the car a limousine effect and has heavy lights of glass that are removable in warm weather.

LINCOLN HIGHWAY DAY AUG. 25.

Lincoln Highway Day at the San Francisco Exposition was August 25 when moving pictures that have been made along the highway from Studebaker cars were shown for the first time. Later these pictures will be shown all over the United States.



TO ITS series of cars that includes a four-cylinder type sold for \$750, and a Knight motored chassis at \$1095, the Willys-Overland Company of Toledo, O., has added a 1916 "Six," which is to sell for \$1145. The number of sixes to be built during the year, according to present plans, will be about 7000, which, though not a large number compared with other Willys' production figures, is what would be regarded as the output of the average plant.

The new car has been especially designed for silent operation. In the new motor helical gears have been used instead of the old type spirals. Silence, less weight and greater accessibility, are gained by this change. The bore is 3.5 inches and the stroke is 5.25 inches, giving an S. A. E. rating of 29.4 horsepower and a cubic piston displacement of 303 inches. The motor will, claim is made, develop 45 horsepower at reasonably high speeds.

The generator and magneto are driven in tandem from the water pump shaft on the right side of the motor and are so placed as not to interfere with the accessibility of the valves. Leather disc clutches are used between the generator and the magneto, making a silent drive and doing away with all slack in the drive.

The large exhaust pipe is divided vertically in such a way that the exhaust from the three front cylinders is taken on one side of it and from the three back cylinders on the other side. This is to prevent the exhaust pressures from different directions creating back pressure.

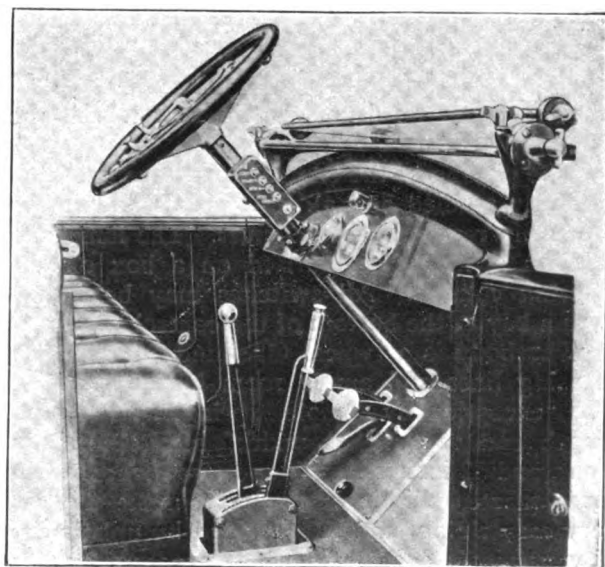
Heated Air for Carburetor.

On the other side of the motor is the carburetor, a special horizontal design, directly at-

tached to the cylinder block and the starting motor, which is mounted higher than usual. Air for the carburetor is drawn through the cylinder casting and is heated in the intake manifold. The starting motor is placed high up on the motor and the Bendix drive is easily reached for such lubrication as it needs.

The motor is lubricated by a plunger pump, which forces the oil under pressure to the crankshaft bearings, the pump shaft bearing and the timing gears. Troughs catch the overflow and dippers on the connecting rods lubricate the cylinders, pistons, camshaft and valve tappets by splash.

The clutch is an aluminum cone with leather

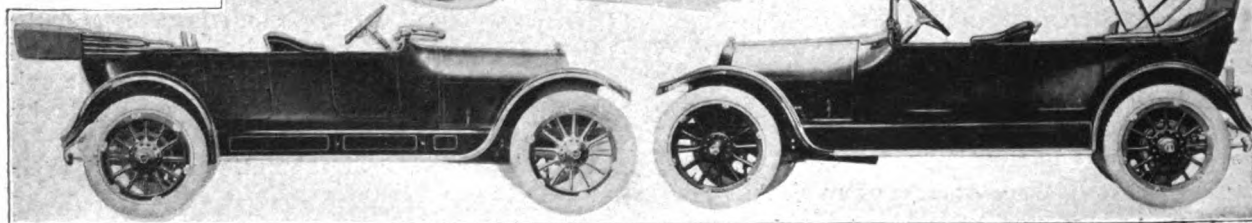
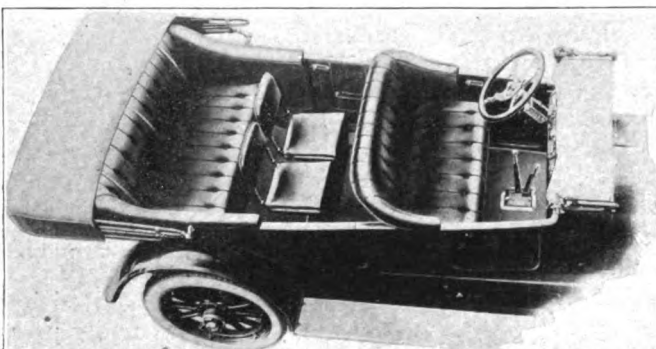


Driver's Compartment of Overland Model 86, Six Cylinder

facing fitted with three springs to insure gradual engagement. Inequalities in the tension of the spring are equalized by a floating spider inside of the flywheel. The pressure on the clutch pedal need be very light and the pedal is adjustable for drivers of various stature.

The transmission gearset is a three-speed ratio selective type, with stub tooth gear teeth of nickel steel, double heat treated. It is located on the rear axle. The rear part of the chassis is quite similar to that of the Overland Four, although the rear axle has been strengthened to bear the heavier stresses. It is a floating type with road wheels mounted on double rows of Timken bearings. There is a four-pinion bevel type differential with roller bearings to support it and the crown gear.

There is one universal joint located well forward on the driving shaft. Brakes of exceptionally large size, of the internal expanding and external con-



Three Views of Overland Model 86, Six-Cylinder, 45 Horsepower, 125-inch Wheelbase, Seven Passenger Touring Car—\$1145.

tracting types, on drums on the rear wheels are fitted.

The placing of the control apparatus has been carefully studied and all foot pedals and levers are easily reached by the driver. The lamp and ignition switches are carried on a box on the steering column. All switches may be locked with a key at the bottom of the control box.

The body is a typical Overland design, with pleasing lines and ample room in the tonneau. The exceptionally ample springs, 38 inches length and two inches width, semi-elliptic in front, and 52 inches length and two inches width three-quarter elliptic in the rear, make the car very easy riding, and this is aided by upholstery of very ample depth. The best grade of leather is used. The two auxiliary seats in the tonneau

fold out of the way when not in use.

The tires are 35 by 4½-inch Fisks, with non-skids in the rear. An extra demountable rim is supplied. Other equipment includes the two-unit, six-volt lighting and starting system with head, tail and dash lamps and head light dimmers; ammeter, speedometer, one-man top, rain vision ventilating type windshield with universal adjustment, electric horn, muffler cut-out, hinged robe rail, foot rest, tire carriers in rear, extra demountable rim, full set of tools, tire repair kit, jack and pump.

DEALERS' SHOW FOR NEWARK.

A celebration in Newark, N. J., next year will commemorate the 250th anniversary of the founding of the city and one of its features will be an automobile show sometime in February, shortly after the New York City show has been held. Last year the Newark dealers did not show on the ground that all

their customers saw the cars at New York and it was therefore unnecessary. Many out of town visitors are expected in Newark to attend the celebration.

Instead of placing the spark plug at one side of an L-head cylinder the Marmon company places it in the middle of the combustion chamber and directly over the centre of the piston. This they believe places the spark where it can spread most rapidly to all parts of the combustion chamber thus increasing the power of the motor.

The ignition should be switched off, the emergency brake applied and the speed lever placed in neutral whenever a car is stopped.

GENEMOTOR EQUIPMENT FOR FORD CARS.

Enduring, Economical and Easily Controlled Single-Unit System that Cranks the Engine and Charges Current for Lighting in Ample Storage Battery.

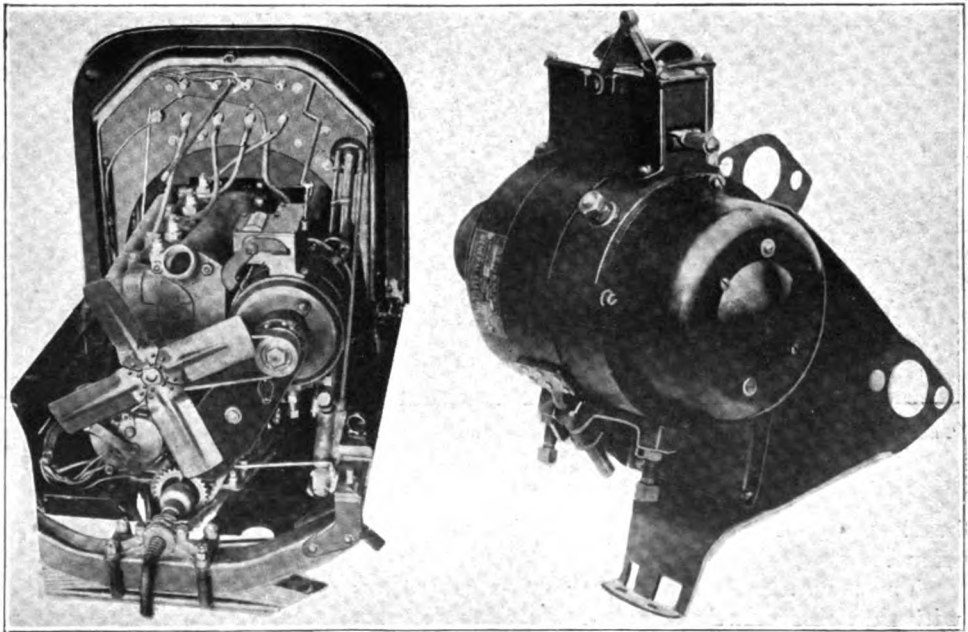
TO MEET the requirements of owners of Ford cars who wish to improve their machines by the addition of an electric engine cranking and lighting system, the Genemotor equipment, built by the General Electric Company, and distributed by A. J. Picard & Co., 1720-22 Broadway, New York City, is claimed to have exceptional qualities. It was designed by an engineer of much experience in motor construction and was subjected to long laboratory and service trials before it was regarded as sufficiently proven to afford the efficiency and economy and have the endurance that was desired.

The Genemotor is a single unit, the machine being a combination motor-generator that is mounted on the left side at the forward end of the cylinder block casting and is driven by a chain from a sprocket on the forward extension of the crankshaft. This same chain drives the engine when the machine is serving as a motor. The control is exceedingly simple, and it can be operated by a child or woman. The engine is cranked by the motor, which is started by merely pressing a button

fixed in the dash, and the lights are controlled by a switch located conveniently in front of the driver. The button and the switch may be operated as often as desired without leaving the seat. With the Genemotor equipment the Ford car is complete from the viewpoint of the discriminating motorist, for it has every facility and convenience that can be obtained in the largest and most expensive cars.

The utility of the Genemotor is obvious. The

equipment is complete and it is received by the owner ready for installation. The system can be installed by any owner who has ordinary mechanical knowledge and experience with tools, or the work can be done in any garage or repair shop in a few hours. Besides the machine itself the equipment includes a storage battery of six cells and 42 ampere-hours capacity, which is installed on the right running board of the car, and the cable for wiring and the switch for controlling the lights. The lighting switch is mounted at the right of the coil box or vibrator case, as one sits in the car, and with it head lamps, dash



At Left, Genemotor Starting and Lighting System Installed on a Ford Engine; at Right, Genemotor and Switch Assembly and the Special Bracket for Installing.

lamps and tail lamp can be lighted in groups as mentioned or as a whole, or any combination that may be desired.

The machine itself is a small unit, being enclosed in a cast steel cylindrical case that is known as the frame, and is about seven inches diameter and 10 inches length. The weight is approximately 52 pounds. The forward or pinion end of the shaft of the unit carries a 13-tooth-steel sprocket, and beyond this is a pulley for the

fan belt. The Genemotor is driven by a silent chain from a 28-tooth sprocket on the forward extension of the crankshaft. This chain is partly enclosed by a guard of sheet metal that covers the front and one side, preventing any object striking the chain.

Four-Pole Compound-Wound Type.

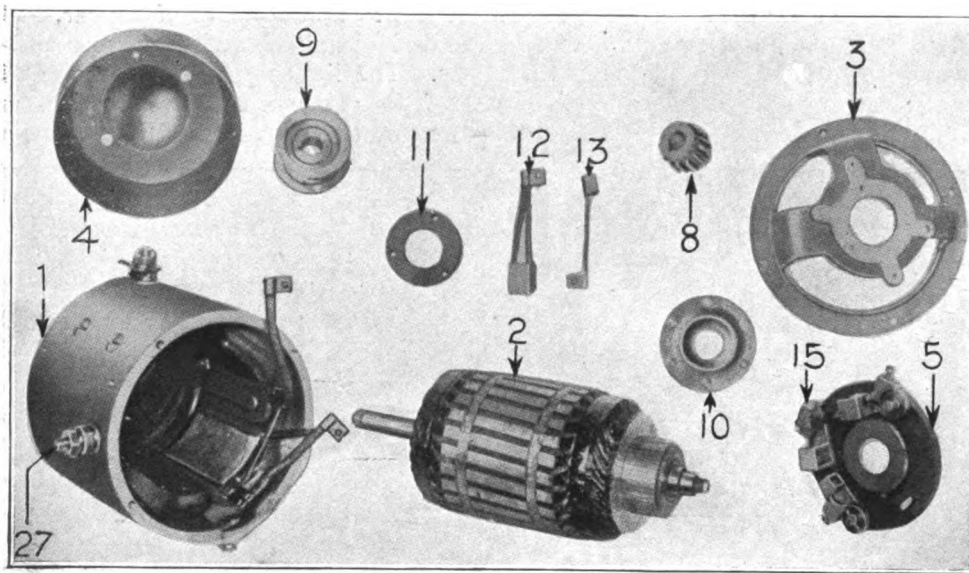
On top of the Genemotor housing is a cut-out and starting switch, which are enclosed in a small rectangular housing bolted to the frame. The machine itself is a four-pole compound wound type, with the armature mounted in annular ball bearings. The commutator is at the rear end as it is mounted on the engine, and the brush holder, which carries the two main brushes and the regulating brush, and the spider carrying the

by bolts that attach the oil pan to the engine case. The forward upper support is formed by a portion of the casting that replaces the water outlet from the cylinder jackets, and the rear upper support is a part of the bracket casting that replaces the water intake manifold at the side of the cylinder block. When the Genemotor is mounted in the bracket it is secured by a steel strap, and its height can be changed by adjusting bolts and nuts so as to obtain correct driving chain alignment and tension.

Operation of the System.

The operation of the Genemotor is automatic after it has been started by pressing the button of the switch rod, the opening being completed after the rod button has been released. The

motor will quickly accelerate, it having power to crank a Ford engine 150 revolutions a minute, which is much faster than is necessary to obtain firing in the cylinders. The motor will develop a torque of about 45 foot-pounds, and with the reduction of 2.15:1 this has been found sufficient for meeting all conditions, either from low temperature or tight adjustment of the engine. The claim is made that it will exert a pressure



The General Motor Disassembled: 1, Frame; 2, Armature; 3, Commutator End Bearing Head; 4, Commutator End Enclosing Cover; 5, Brush Holder, Complete; 8, Chain Sprocket; 9, Pulley; 10, Retaining Washer, Pinion End; 11, Retaining Washer, Commutator End; 12, Main Brush; 13, Regulating Brush; 15, Brush Holder Springs; 27, Terminal.

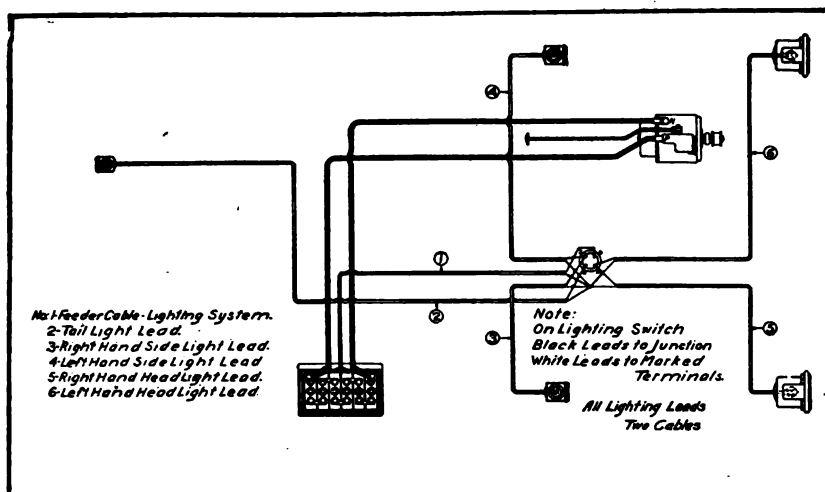
bearing, are covered by a housing bolted to the frame.

The armature is a conventional construction with the coil channels at a slight angle to the axis of the armature to minimize noise and prevent heating from the formation of eddy currents. The four pole or field pieces are bolted to the frame with centres 90 degrees apart, and each has two coils of wiring. The armature and field coils are thoroughly insulated and, being enclosed in a dust and oil tight case, no attention is necessary other than to pack the ball bearings of the armature shaft with pure vaseline once a season, and to clean the brushes and starting switch contacts.

The Genemotor is mounted in a malleable iron or steel bracket that is secured at the base

of 95 foot-pounds at 10 degrees below zero.

When the motor has started the engine firing and the engine speed reaches a certain number of revolutions the motor becomes a generator and develops a voltage or electromotive force sufficiently high to overcome the normal voltage of the battery, and charging of the battery is begun. This will continue so long as the Genemotor is driven as a generator. Charging follows the closing of the reverse current relay, which insures that the current will only flow in one direction, and the amperage of the current will increase gradually until it is slightly in excess of 10 amperes. When the speed of the machine falls below the number of revolutions for charging the reverse current relay will open, preventing the current driving it as a motor.



Wiring Diagram for the Installation of the Genemotor Starting and Lighting System in a Ford Chassis.

The manner of installing the Genemotor system on the engine and connecting it for starting is thus described, and should be read with the sketch of the end and side elevations of the system installed on a Ford engine.

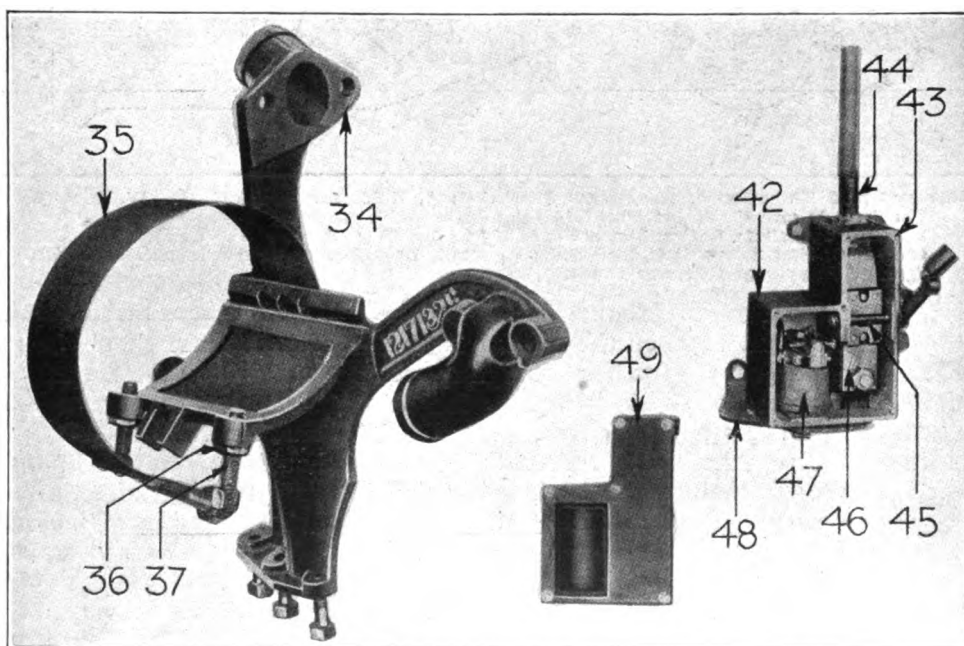
Disconnect the radiator and remove the water connections and elbows from the engine. Remove the claw from the starting crank and take out the starting clutch. Remove the fan belt pulley from the engine crankshaft. Remove the right hand crankcase bolts necessary to allow the bracket to be attached (A). Remove the fan from its supporting arm. Remove the primer rod from the carburetor. Remove the timer rod. Remove the Genemotor from the bracket and fan pulley from the Genemotor shaft.

Clean the engine thoroughly to insure proper seating of bracket, and remove any high spots or fins on castings that may interfere. Mount the bracket on the engine, inserting the base bolts first and water flange

chain is in place. Jack a rear wheel and turn slowly to feed the chain on the engine sprocket. Connect the ends of the chain together. Read and follow closely the instructions regarding the direction of rotation of the chain; also the method of connecting. Note arrows on the side of chain showing direction that chain must rotate.

Mounting the Machine.

Mount the Genemotor on the bracket with the switch in a vertical position, slipping the sprocket through the chain. Clamp the steel band in



Genemotor Bracket and Switch: 34, Bracket, Complete; 35, Strap; 36, Adjusting Nut; 37, Lock Nut; 42, Switch; 43, Switch Box; 44, Positive Lead to Battery; 45, Cam, with Leader; 46, Switch Blade; 47, Cut-Out; 48, Connector; 49, Switch Cover.

place but do not tighten it until the chain is properly adjusted. Apply a straight edge and align the sprockets accurately, making sure that the Genemotor shaft is parallel with the crank shaft. In adjusting allow a slight amount of slack, as specified by chain manufacturer. Adjustment is secured by raising the motor by the two set screws (K) in cradle. When such an adjustment is made be sure the starting switch is in an upright position on top of motor, and tighten the clamping strap. Grease the chain thoroughly and attach the chain guard (L). Clamp the pulley supplied over the fan pulley, filling the flanges if necessary.

Replace the fan and bracket, and if the fan blades should not clear the pulley properly, twist them slightly with a wrench and bend out the

and note the alignment, clearance and operation.

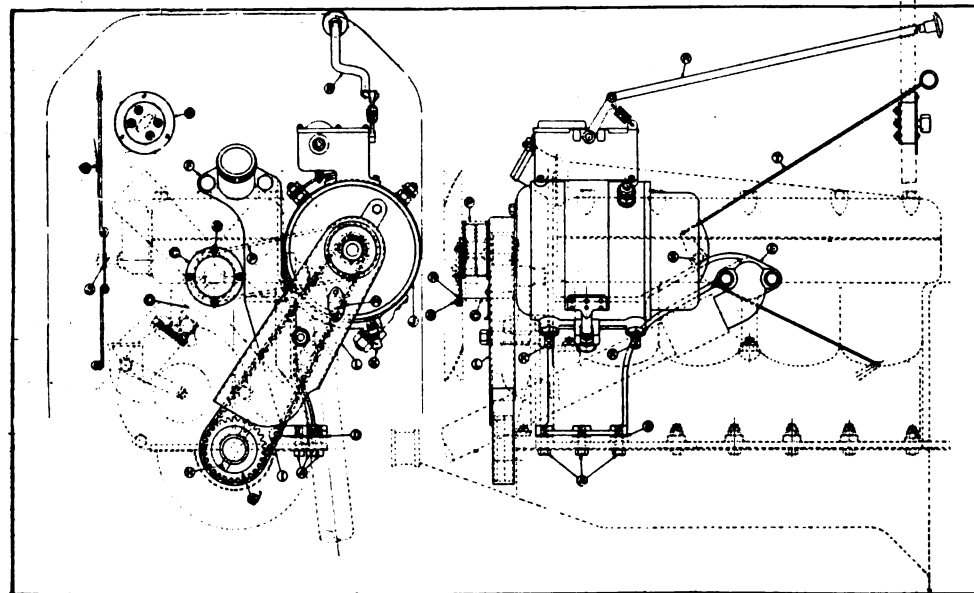
The dashboard is to be bored for lighting switch (Q) on the right hand side (viewed from seat), directly under gasoline supply adjustment, and on the left side close to the coil box for the starting switch rod (R). On the sedan, coupelet and 1915 models, the lighting switch should be placed on the upper left hand corner of the heel board under the driver's seat. Mount primer lever and special washer (S) under second manifold stud nut, passing the original rod through the dashboard.

Installing the Chain.

The chain should be passed around the engine sprocket according to the instructions, the arrows on the links pointing in the direction in which the chain runs. The ends should then be joined, and

a smooth drift or wire passed through the links, after which the seat pin and rocker pin should be placed together. Washers should then be placed on the pin and the ends carefully riveted.

It is of the utmost importance that the shaft of the Genemotor be parallel with the crankshaft, and a straight edge placed in the guiding grooves of both sprockets must be at right angles to the shaft. These instructions are essential to successful re-



Side and End Elevation of Genemotor Installed; A, Bolts for Bracket; D, Washers for Bracket; E and F, Water Manifold Connections; G, Driving Sprocket; H, Pin for Driving Sprocket; I, Crankcase Nose; K, Adjusting Screws in Cradle; L, Chain Guard; O, Fan Bracket; P, Fan Belt; Q, Dash Lighting Switch; R, Starting Rod; S, Special Washer and Primer Level.

tips of the fan blades. Mount the fan bracket (O) on the engine. Put on the regular fan belt (P). Do not adjust the fan belt too tightly. Reduce the thickness of the lock nut for fan belt adjustment if necessary to obtain proper belt tension. Replace the timer rod, making sure that it clears the chain guard by bending timer rod as necessary. Replace the starting crank and turn the engine over by hand to make sure that the chain is properly adjusted and free. It is essential that the chain does not touch the nose piece of the motor or the side rivet heads. Before replacing the radiator and water connection, it is advisable to run the engine a few minutes

results. Before running the chain, a good quality of cup grease should be rubbed on the inside of the chain by the finger. Do not use graphite or lubricants containing any solid matter under any conditions. If the chain becomes "gummy," it should be cleaned by brushing with kerosene while running, afterwards lubricating as before.

The lighting wiring system can best be installed by reference to the diagram showing the layout. All leads are marked for proper connection, and with the use of the diagram the installation can be readily made. The battery box should be mounted on the right running board, where it is held by hold-down clamps.

GENERAL NEWS OF THE INDUSTRY.

Studebaker Expected to Earn \$16,000,000 — Kelly-Springfield May Pay Dividends to Common Stock—Abbott Debts Have Been Paid in Full.

NET earnings for the Studebaker Corporation for the first six months of the year are reported to have been in the neighborhood of \$6,300,000. Orders already on hand for the second half of the year make it appear that earnings will be even larger, and a total for the year of about \$13,000,000 is expected. This compares with \$1,772,473 for 1913 and \$4,441,966 in 1914.

The earnings this year, after paying 7 per cent. on the preferred stock, should amount to 40 per cent. on the common, which amounts to \$27,931,600.

KELLY-SPRINGFIELD EARNINGS.

Net earnings of the Kelly-Springfield Tire Company for the first half of 1915 were in excess of \$700,000. Net earnings for the full year 1914 were reported as \$1,215,144. The directors are confident that the second half of 1915 will exceed the first half and that the year's total will exceed \$1,500,000. Net on that amount, after deduction for bond interest and dividends on the preferred, would leave approximately 25 per cent. for the common stock. It is felt in some quarters that an extra distribution of some kind to holders of common stock is practically a certainty this fall.

ABBOTT CREDITORS PAID OFF.

The debts of the Abbott Motor Company, which were assumed by the Consolidated Car Company when it took over the business, have been paid in full, the final installment having just been paid to the Detroit Trust Company. This is said to be the first instance in which a motor car company in financial difficulties has been taken over on such a basis and payments made in full. C. L. Lewis, president of the company, is much pleased over the progress the new company has made and he believes that the payment of the old debts is proof of the ability of the new organization and the quality of its product.

The Abbott Company, which was operated by Pittsburg capital, became involved about a year

ago, and M. J. Hammers, who had been connected with the production and sales departments of the company, took an option on it. He interested C. L. Lewis of Toledo and other Toledo capitalists in the project, and the new company began production of an eight-cylinder car the first of the year.

OLDS SELLS THREE BRANCHES.

Branches of the Olds Motor Works, in Buffalo, San Francisco and Los Angeles, have been sold and the business of the company turned over to distributors possessing large resources. Louis Engle, Jr., has bought the Buffalo branch. He will conduct the business under the same name, The Oldsmobile Company of Buffalo. The Los Angeles and San Francisco branches have been sold to Harmon D. Ryus, who takes over the entire coast territory for the company. Ryus has been managing the Los Angeles branch for some time and is president and manager of the new company. Associated with him is S. F. Seager, of the Seager Engine Works, Lansing, Mich.

LARGE EARNINGS IN OIL BUSINESS.

Net earnings of the Texas Company for the year ended June 30 are shown by the annual report to have been approximately \$200,000 greater than for the preceding year. After deducting \$1,631,365 for reserve the total net earnings were \$6,393,327. This is equal to 21.3 per cent. on the total capitalization of the company, which is \$30,000,000. Gross earnings amounted to \$26,391,745 as compared with \$25,924,405 for last year.

CHALMERS BIG JULY OUTPUT.

Chalmers sales for the month of July were 300 per cent. greater than for July, 1914, according to C. A. Pfeffer, vice president and assistant general manager of the Chalmers Motor Car Company. Notwithstanding the fact that large factory additions have been made to take care of 1916 production and the machinery is running

night and day, it is very difficult to keep up with demand.

ROSS EIGHT IN LONDON.

John Overton, of the London firm of Mann-Overton, Ltd., has returned to England where he will undertake the introduction of the Ross Eight. He has placed an order for 500 of these cars and has the exclusive agency for Great Britain and its colonies.

KLINE PLANT BOUGHT.

The buildings, machinery, fixtures, real estate of 14,676 acres and the right to use the

name of "Kline Car" were transferred recently to the Kline Car Corporation, a new concern chartered by the Richmond (Va.) Trust and Savings Company, the trustee under the deed of trust under which the property was sold at public auction last March.



William Blanchard, New England Distributor for Cunninghams.

It was declared recently by an officer of the new corporation that plans are under way for the early manufacture of a moderately priced car, which will soon be placed on the market.

CORPORATION CHANGES HANDS.

Control of the Driggs-Seabury Ordnance Corporation, with plants at Sharon, Penn., and manufacturer of automobile trucks, as well as war munitions, is reported as having been taken over by the recently formed Driggs-Seabury Ordnance Company. Manufacturing management, it is understood, is to be placed in the hands of well known men who formerly were officers of the Bethlehem Steel Company. Heretofore the corporation has not manufactured mu-

nitions for the belligerent European nations because of the peace proclivities of its president, John Stevenson, Jr.

PREMIER FACTORY MAY MOVE.

That the transfer of the Premier Motor Manufacturing company's factory to Minneapolis or St. Paul is still to be expected is indicated by the statement that civic and commercial bodies of those cities are offering attractive propositions to President Frank E. Smith. The matter is still undecided, according to latest reports.

LEAVES AUTOMOBILE TRADE.

Owing to the rapidity of its growth changes have been frequent in the automobile business, but trade circles received a greater shock than usual when it was announced that Milton J. Budlong, president of the Packard distributing companies in New York, Philadelphia and Chicago, had resigned to become vice president of the importing and exporting firm of Gaston, Williams & Wigmore, Inc., with offices at 140 Broadway, New York City.

The position which Mr. Budlong left is one of the largest in the distributing division of the automobile trade. He had occupied it for more than seven years and was one of the men on whom the Packard organization placed the greatest dependence. Since the war began Gaston, Williams & Wigmore have bought more than 7000 trucks and passenger cars in the United States and in the course of its purchasing came into close contact with Mr. Budlong and were much impressed with his ability. They believe that American export trade is to be much larger after the war and they desired an American representative of the largest caliber.

Mr. Budlong, like so many other automobile executives, began his career in the bicycle business and in the latter days of the heyday of that trade was manager of the Pope Chicago branch. There he made the acquaintance of George H. Day. Mr. Day later became manager of the Association of Licensed Automobile Manufacturers and upon his death Mr. Budlong succeeded him in that position. Seven years ago he left that position to enter the Packard organization. On accepting his resignation President Joy of the Packard Motor Car Company expressed the greatest regret at losing him.

Mr. Budlong is succeeded in control of the New York and Philadelphia branches of the company by E. B. Jackson, previously manager

of the Philadelphia branch, and H. M. Allison, manager of the Chicago branch, becomes its president. Mr. Jackson entered the automobile business in 1902, being employed first by John Wanamaker to sell the Searchmount, a car now forgotten by the majority. His second venture was as a sales representative of the Dorris. He joined the sales staff of the New York Packard branch in 1907 and became sales manager before he was made general manager of the Philadelphia business, in 1910. He is one of the oldest and best known of Packard executives.

Mr. Allison has been manager of the Packard Chicago branch for four years. He has been secretary-treasurer of the Chicago Motor Car Company for nearly five years, and president of the Chicago Automobile Trade Association for two years.

SMITH JOINS CHALMERS.

Frank H. Smith formerly with the Studebaker Corporation and at one time Northwest District Manager for the Hudson Motor Car Company, has joined the Chalmers sales force as special representative. He will spend much of his time on the road as a connecting link between the factory and the retailer.

BLANCHARD TO SELL CUNNINGHAMS.

William Blanchard, best known in the East for his remarkable sales records with the Lenox Motor Car Company of Boston, has taken over the New England territory for the sale of Cunningham four cylinder cars, the product of the J. Cunningham Son & Company, Rochester, N. Y.

Prior to his connection with the Lenox company, which he joined in 1911, Mr. Blanchard had been for four years with the Eastern Machine Company, the maker of Morse cars, where he worked in every department, serving his full time at the bench, in the shop and eventually as salesman. Going to the



Milton J. Budlong, Retiring President of Packard Subsidiary Companies.

Lenox company as a salesman, he soon won promotion to sales manager and was elected to the directorate.

Successful as he was with the Morse and Lenox lines, he is expected to establish new records with the Cunningham product, which includes the full line of pleasure cars, hearses and ambulances. The Cunningham pleasure car has a four cylinder motor with bore of $4\frac{3}{4}$ inches and stroke of $5\frac{3}{4}$ inches, and develops 36.1 horsepower, according to the S. A. E. formula. Wheelbase is 130 inches. The lighting and starting system is the Westinghouse. It has Stromberg and Rayfield carburetors and Bosch high tension ignition. Standard equipment is practically complete in every detail, and includes one-man top, windshield, Warner speedometer, tire carrier for two extra tires, horns and lamps, etc.

HYATT ADDS TO STAFF.

Cliff Noble has been appointed assistant advertising manager of the Hyatt Roller Bearing Company, Detroit. He has had wide experience in advertising, principally devoted to mechanical subjects. He was connected with the National Cash Register Company in the advertising department. His new connection will bring him in association with W. E. Biggers, advertising manager.

WILLEMIN IS PROMOTED.

A. B. Willemin, who has for three years been director of purchases for the Hupp Motor Car Company, has been made assistant general manager. He was purchasing agent for the Brush Runabout Company until that concern was closed out and then became assistant general manager of the Lion Motor Car Company of Adrian. He then took charge of the Elmore company at Clyde, O., and closed out that concern for the General Motors Company. He then joined the Hupp company.



E. B. Jackson, Now President of Packard New York and Philadelphia Branches.



H. M. Allison, Recently Appointed President of Packard Chicago Branch.

S. & M. RUBBER REORGANIZED.

Stockholders of the defunct S. & M. Rubber Company, Coshocton, O., have exchanged shares in the stock of that company for stock in the McClurg Rubber Company, which takes over both the assets and liabilities of the concern. All unpaid stock in the old company was cancelled by the courts. This excluded from the reorganization the promoters of the old concern, who held large blocks of stock for which, the court held, they had given no return in money or services.

DELAWARE A CORPORATION STATE.

Since the passage of the "Seven Sisters" laws regarding corporations in New Jersey that state has lost its popularity as the home state for large corporations and Delaware has in a measure taken its place. Three large corporations, which aim to enter the automobile business, have been recently incorporated by Wilmington attorneys. These are the Perfection Tire Sales Company, capital \$1,000,000; Motor Devices Company, capital \$500,000; and the Wright Motor Car Company with \$300,000 capital.

BRUSKE GIVES UP RACING.

The Maxwell Motor Sales Corporation announces the return of Paul Hale Bruske, formerly manager of the Maxwell racing team, to the Maxwell factory to assume charge of the newspaper work of the company. Mr. Bruske handled the Maxwell racers from the first of the year until its recent dissolution. Prior to his Maxwell connection he did similar work on the staff of the Studebaker Corporation.

TWO PLANTS GRANT EIGHT-HOUR DAY.

The Locomobile Company of America has granted the men at its plants, who threatened a strike, an eight-hour day. The company had announced a war bonus plan but this was withdrawn when the men refused it and demanded instead a shorter working day.

The Bosch Magneto Company has also granted its employees an eight-hour day instead of 9½ hours.

MAXWELL TO RETIRE STOCK.

A block of the first preferred stock issued by the Maxwell Motor Company at the time it took

over the business of the United States Motor Company will be retired on Sept. 18 by the Central Trust Company of New York City, under an agreement made in January, 1913. The sum of \$130,000 has been set aside for the purpose and sealed bids, giving the number and price of the shares offered, are asked by the trust company before Sept. 17.

SPEEDWELL PAYS \$9000 DIVIDENDS.

Bondholders of the Speedwell Motor Car Company were recently awarded a dividend of six per cent., which totals about \$9000. The sale of the plant, to satisfy a judgment of \$150,000 obtained by the bondholders, is scheduled to take place Oct. 11 on the court house steps at Dayton, O.

NEW SALES MANAGER FOR WINTON.

The appointment of Orlan F. Baughman as sales manager of the Winton company, Cleveland, O., was recently announced by General Manager Churchill. Mr. Baughman has been associated with the Winton sales department since 1903, and his appointment represents merited promotion.

ROLLS-ROYCE PASSES DIVIDEND.

Rolls-Royce, Ltd., the English automobile maker, has passed its usual dividend on the ground that the press of war business and the control of the plant by the government makes it impossible to halt work long enough to take stock and determine whether a dividend has been earned or the amount of it.

The Louisville Trust Company has announced that there will be no dividend paid to the creditors of the Wilkes-Grant Company, for which it has been receiver, as the assets of the concern proved to be worthless.

Notification has reached the Splitdorf Electrical Company of Newark, N. J., that the highest award in its class has been given the Dixie Magneto by the judges at the Panama-Pacific Exposition.

George C. Brainard, assistant sales manager of the Hydraulic Pressed Steel Company, Cleveland, has been made chief engineer of that company.

PRACTICAL MOTOR CAR REPAIRS.

A condition that causes ignition failure sometimes realized in some motors of earlier design, is that grease and oil will eventually find a

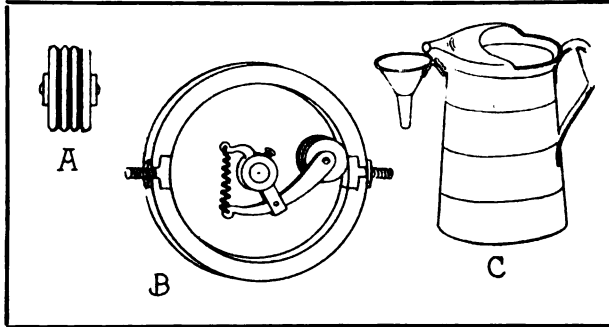


Fig 76—A-B, Grooves in Timer Roll to Insure Positive Contact; C, Combining Measure and Funnel.

way into the timer, causing a poor contact between the roll and contact plates. Of course the proper restoration is to replace the worn parts with new, so as to stop the leakage of lubricant, but if the owner wishes more economical replacement, a simple repair can be made, as is shown in Fig. 76 A-B. Remove the roll, and if it hardened it should be annealed. It can then be placed in a lathe and grooves cut as illustrated. These grooves, however, should not be made too sharp, else they will cut the fibre shell. The principle in view is to have the edges cut through the grease and oil and thus insure a positive contact.

LAPPING PISTON RINGS.

Better service can always be obtained from a motor that has had the piston rings lapped in. There are several ways of accomplishing this operation, but the easiest of any is that shown in Fig. 77B. Whether it is a single cylinder, or a block, it can be gripped in the vise by the lip at the bottom, the main weight being supported on the bench by small blocks of wood, as shown. This permits a horizontal movement of the piston and allows the workman to use his strength in a natural and untiring manner. Of

course, a small block should be placed in the combustion chamber of the cylinder so that the piston rings cannot enter the chamber and expand. The number of blocks to support the weight of the cylinder can only be determined by the experimentation.

COMBINING A FUNNEL AND MEASURE

It is more convenient for the workman to use a liquid measure that has the funnel attached than to use two separate units. When such is not at hand, the ordinary funnel and measure may be combined, as in Fig. 76C. Obtain a small hinge and solder one end to the upper part of the measure and the other to the funnel. This arrangement prevents any liquid from spilling and allows the funnel to be placed at any angle.

USING VISE AS A PRESS.

It is always better, wherever possible, to use the press for forcing in bushings or pins, than to resort to the hammer. For pressing in small bushings such as are used in the upper end of the connecting rod, valve rocker arm, steering knuckle, etc., nothing is handier and more practical than the ordinary bench vise. Fig 77A illustrates the method of forcing in a steering knuckle bushing.

AUTOMATIC SWITCH FOR GARAGE.

Electric lights in a garage basement are often left switched on by accident and current is need-

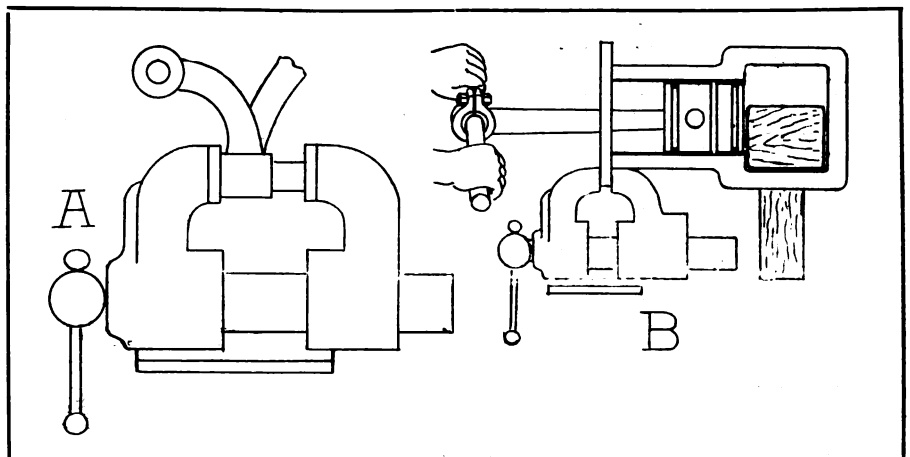


Fig. 77—A, Using Vise as Press to Force in Steering Knuckle Bushing; B, Lapping Piston Rings.

lessly consumed. A switch that will automatically cut off the lights is illustrated in Fig. 78. Thin planks are hinged on two stairs, as shown,

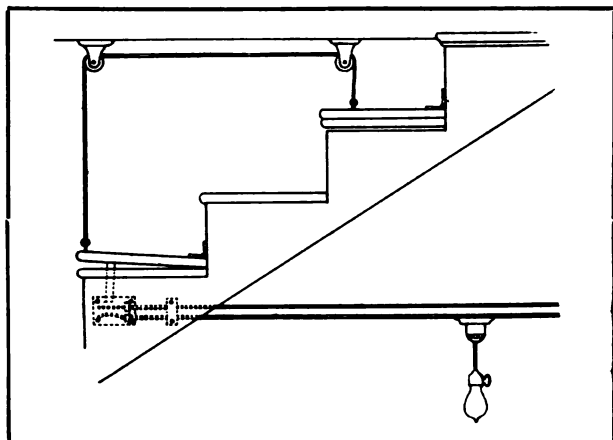


Fig. 78—How to Design Automatic Switch for the Garage Basement.

and attached to each is a piece of wire running over two pulleys screwed into the ceiling. The wire should be of a proper length to slightly raise one board when the other is down. The switch is composed of two pieces of sheet brass and is situated directly under the lower stair. A wood plunger is then secured to the bottom hinged board and passed through the stair directly over the switch. The action is obvious. The attendant descending into the basement steps on the bottom board and the wood plunger forces top blade of switch into contact with the lower blade, completing the contact and lighting the lights. The weight of the board maintains the contact. When ascending the stairs the top board is the last to be stepped on. The lower board is raised, the blades of the switch are sprung apart, breaking the contact and extinguishing the lights.

HOW TO MAKE A CREEPER.

A well constructed creeper is valuable equipment for the private as well as the public garage when much work has to be done from under the car. Any person handy with tools can make one as shown in Fig. 79 at trifling expense and with little labor. Cut three 30-inch lengths from a piece of pine wood that is two inches thick and four inches wide. Bore holes in two of these pieces so as to hold the iron socket of a strong caster, shown at C. Ten slats are then cut from the pine wood, they each being one inch thick, two inches wide and about four feet long. All corners should be rounded at the

top. The slats are then screwed to the cross pieces containing the casters, a space of about one inch being left between each slat. To make the construction more rigid, secure a slat to the bottom, it serving as a brace. At the right hand side of the creeper and to the outside slat attach a tray for the placing of tools. The tray can best be made of thin sheet metal. Obtain a piece about eight inches square and cut away the corners as shown at A. When folded the perfectly shaped tray shown at B will be the result. As a head board, two triangular shaped pieces of one inch board can be screwed to the outside slats at the end and a thin piece of board laid across them. If the parts are properly assembled the result will be similar to that shown at D.

TO REMOVE AND REPLACE CYLINDERS.

The novice can do much damage to a motor if care is not taken when removing or replacing cylinders. To affect a removal, two factors are absolutely necessary to observe; first, that all wires, pipes, manifolds, rods, etc., must be loose or fully removed; second, that provision must be made for a straight lift and to prevent twisting or cramping sideways. When the necessary work has been completed the cylinder walls must be well oiled before replacing. If the cylinders are cast en bloc it is good practise to use a chain hoist and turn the engine over slowly, inserting one piston at a time. Of course the person who guides the pistons must compress the rings so that they will enter the cylinder without breaking. One of the commonest errors made is the fastening of the cylinders to the crank case. All nuts should be placed on their studs and turned down until they start to bind. The final tightening should be done evenly, each nut being turned a half or full turn at a time until the cylinders are secure. Under no circumstances should one nut be fully tightened before turning down tightly on the others.

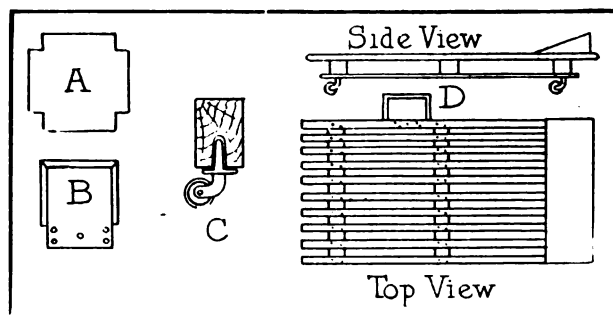


Fig. 79—Diagrammatic Instructions for the Construction of a Creeper.

MOTOR STARTING AND CAR LIGHTING.

Mechanical Generation of Electric Energy—Principles of Dynamo Construction and Characteristics of Direct and Alternating Current Types.

ELECTRIC current may be generated by galvanic or primary cells, or it may be generated by induction. Electrical inductance is that tendency of an electrical conductor or a magnetizable object to become itself magnetized or electrified because of proximity of, but not necessarily actual contact with, a magnet or a magnetic field produced by an electric current. Electro-magnetic induction is the production of electric currents by the cutting of lines of force produced either by a permanent magnet, an electro-magnet or a current carrying conductor. Whenever an inducing current is started, ceases, changes direction or intensity, or whenever a current carrying conductor is moved relatively to another conductor or conductors so as to cause its lines of force to cut the latter, induced currents are produced. The intensity of the induced current is proportionate to the cutting of the lines of force, and the motion is always opposed to the motion of the current that produces it.

How Induction Is Shown.

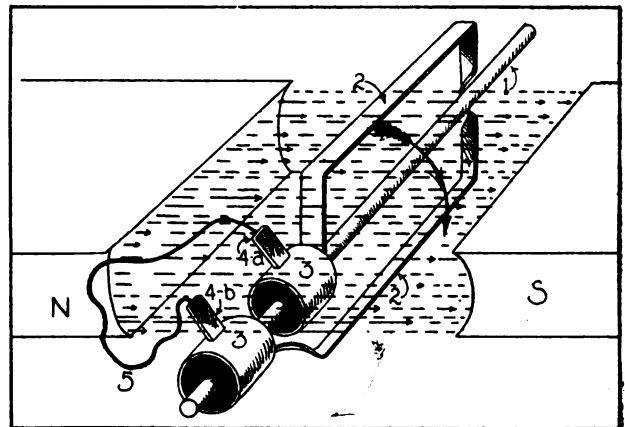
The result of induction may be best illustrated by assuming a circuit of wire in which there is a switch that may be opened and closed connected with a battery. In near proximity to this is another circuit of wire in which is a galvanometer, or current indicator. When the switch of the first circuit is closed a current will move from the positive to the negative pole of the battery, and this will induce a weaker current in the second circuit, which will move in an opposite direction for a very brief period. If the switch of the battery circuit is then opened and the galvanometer is observed a second current will be indicated, weaker and briefer than that first, flowing in a direction opposite to the first, and in the same direction as that made in the battery circuit. The strength of the currents will be proportional to the strength of the inducing current and the proximity of the circuits. But if the circuits are sufficiently separated, the weaker current will move in the same direction as the first. Again, a low resistance wire in the inducing circuit and a high resistance wire in the induced circuit will cause a greater electromotive force in the latter than in the former. Or this condition may be reversed by the condition of

wiring. These laws always obtain in practise.

One will note from the previous explanation of inductance that induction may take place during the flow of a current when a current carrying conductor is moved relatively to another conductor or conductors, so as to cause its lines of force to cut the latter, or when direction or intensity is changed.

The Currents of Magnetism.

Were a copper wire used to carry a current of electricity from one pole of a battery to another, the entire wire would be surrounded by magnetism, this being properly defined as lines of force, and this condition could be determined by placing a pocket compass near the wire. The



Illustrating Principle of Generating Electric Current by Inductance: N and S, North and South Poles of Magnetic Field; 1, Shaft; 2-2, Wire Segments; 3, Collector Rings; 4a and 4b, Brushes; 5, Cable Completing the Circuit.

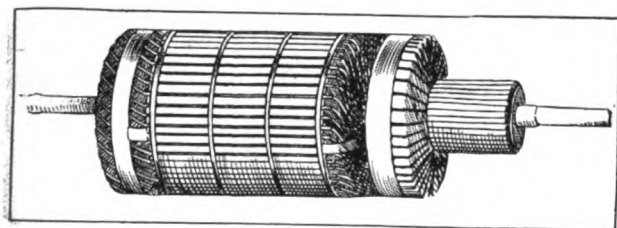
needle would come to rest at right angles to the wire. Were the current reversed the needle would swing until the opposite pole was close to the wire, and itself at right angles, as in the first instance, indicating complete reversal. The wire would be the centre of a magnetic field and there would be a concentric movement of the field about the wire, this being proven from the fact that the lines of force of the magnetic needle of the compass seek to arrange themselves parallel to the lines of force about the wire. These rings of the magnetic field would move in one direction until the reversal of the current, when their movement would be reversed. The north

pole of the needle would point in the direction of the whirl of the lines of force.

If a loop of wire carrying a current is tested with a compass, the loop will be found to have a north magnetic pole on one side and a south magnetic pole on the other, and the lines of force will issue from one side and pass through space to the other. The clockwise flow of the current on one side of the loop indicates a south pole, and the counter-clockwise flow of the current on the other side indicates a north pole. This affords a means of obtaining two different poles in an electro-magnet by connecting the coils correctly.

Principle of the Electro-Magnet.

An electro-magnet may be a coil of wire with or without a core, the number of convolutions and the strength of current determining the capacity. The convolutions are defined as turns, and the combination of current and turns as ampere-turns. From a purely physical standpoint the magnetism producing elements of an electro-magnet are the ampere turns, and these are found by multiplying the turns of wire consti-



General Appearance of an Armature of a Generator of Dynamo with Commutator for Generating Direct Current.

tuting the magnet by the amperes passing through the wire, the total representing ampere turns. The number of lines of force that may be desirable to produce are determined by formula, as are the proportions of the core and the wire to be used for a given construction.

These facts have been stated for the purpose of establishing clearly in the minds of the readers that there are certain well defined principles governing the production of electricity that are unalterable, and that these must be applied in every construction.

Primary cells cannot be used for starting the engine or supplying current for lighting, and while secondary cells could be made to serve a useful purpose for these works, sufficient capacity could only be obtained with batteries so large that both proportions and weight would be impossible. Current is required for any form of the several systems outlined much beyond the capacity of a battery to create, but current can be generated by a machine, some of which may

be used as generated, and the excess can be accumulated and utilized as needed, either for starting the engine, for lighting or for ignition.

Dynamo Generation of Current.

Electric energy is produced by a machine that is known as a dynamo, and the means of generating the electromotive force is by moving conductors in a magnetic field. When mechanical energy is applied to conductors which are passed through magnetic lines of force in a certain direction, an electromotive force is developed in them, which will be proportional to the speed of movement, the number of conductors moved and the strength of the magnetic field. The current produced in these turns or coils of wire will be proportional to the electromotive force generated, and inversely proportional to the resistance. Such a machine is designed for transforming mechanical energy into electrical energy.

A motor is a machine in which electrical energy is transformed into mechanical energy, and both the motor and the dynamo are mutually convertible into each other by the mere fact of applying the power in a mechanical or electrical form. Usually the word dynamo is abandoned and the words generator and motor used to express the type of machine, for the term dynamo actually includes both. As a generator the current is taken from the armature of the machine, and as a motor the current is sent through the armature, so that a generator may be made to serve as a motor or a motor as a generator. The electrical energy is not created by friction, that is, the contact of the brushes upon the armature of the generator, but by the wires wound upon the armature moving near strong magnets.

Construction of a Dynamo.

When polarity exists, a metal may be said to have magnetic influence, and there is a constant flow of magnetic from the one pole to the other. The dynamo is a temporary magnet, and is so constructed that it has pole pieces between which an armature revolves, breaking or interrupting the lines of magnetic influence that are passing from the positive to the negative poles. The pole pieces of the machines are converted into electro-magnets during the time the machine is operated by current sent through the windings of these pieces. The pole pieces are known as the field pieces.

The theory of the dynamo so far as the principle of induction is concerned, may be observed in an accompanying drawing, which represents as N and S the north and south pole pieces of a machine, between which a current of magnetism is flowing so long as the pole pieces are magne-

tized. Between these there is shown a shaft (1) on which are two segments (2) that, one will note, are connected with the rings (3) on the shaft (1). Contacting with these rings are the brushes (4a) and (4b), from which current is taken through the cable (5) to the circuit in which it is used. This form of dynamo will produce an alternating current. The shaft (1) merely carries the armature, which is represented by the segments (2), and the rings (3) are insulated so that the current is collected by the brushes (4a) and (4b) and carried off on the cable.

The Principle of the Armature.

The armature in practise is made up of a large number of segments or coils of wire, and when the armature is turned the segments or coils will cut or interrupt the lines of force or magnetism between the north and the south poles. As shown in the drawing the segments are at right angles to the lines of force and at that point offer the greatest obstruction to the lines of force, while they do not obstruct them when turned in the direction of the flow. With the revolution of the shaft the current induced in the circuit formed by the segments and the brushes and the cable connecting the brushes will be constantly changed in direction and strength as the segments approach and recede from the pole pieces. Because of this variance the current will alternate in delivery and flow in opposite directions, rising from zero to maximum and subsiding from maximum to zero so long as the movement of the segments is continued. The current is changed to flow in one direction by the addition of a commutator. The description is intended to illustrate the principle only, for in practise the armature consists of a considerable number of segments and the lines of force are separately interrupted by each of these as the armature revolves.

Each convolution of wire in an armature winding carrying a given current possesses a definite magneto-motive force, and with the increase of these convolutions the force is increased, the magnetism being forced through the wire. The turns of wire intensify the current, and when they are so arranged that their effect upon each other produces motion the power resultant is proportionate to the magnetic influence caused by the arrangement of the coils and poles, and, of course, the speed of rotation.

How Power Is Produced.

When the lines of force of two fields meet and seek to establish parallelism, the arrangement is tangential with reference to the line of one field, and in the case of the electric motor

the lines of force pass from the north to the south pole through the armature core. When the armature is wound with wire it may have a number of positions with reference to the vertical or horizontal plane. To illustrate this, it may be well to consider several positions, the first of which is with the coil in the horizontal plane. This may be noted in the illustration. Assuming that the coil has not influenced the magnetic field, the lines of force pass from the north to the south poles of the magnet, but when the coil is energized by a current it manifests every quality of any electro-magnet, despite the fact that it is within a magnetic field.

Action of the Magnetic Influence.

The core of the armature is soft iron laminae, and the core is magnetized by the current circulating in the coil. Without the core the influence of the current would be weak, but with the core it is greatly intensified, and the lines of force are at right angles with those flowing between the poles. As the poles of the coil will seek the opposite poles of the original magnet, this causes

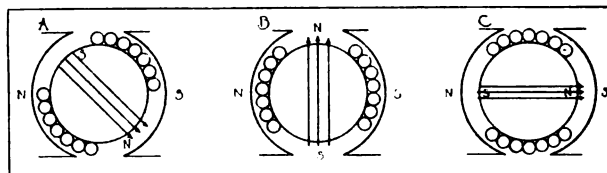


Illustration of the Action of an Electric Motor: A, Coil at Angle of 45 Degrees, Producing Magnetic Field at Right Angles with Power Caused by Tendency of the Lines of Force to Become Parallel; B, Position of Coil Not Influenced by Magnetic Field, C, Position of Coil with Lines of Force in Parallelism.

a movement of the coil or armature in the direction governed by the location of the poles created by the ampere-turns of the horizontal coil and those of the field in which the armature core is suspended. As the tendency of the lines of force of the coil is to establish parallelism with the lines of force of the magnetic field, motion is created.

But assuming that the coil is in a vertical plane, the magnetic field produced by the coil is at right angles to it, or in the horizontal plane, and these will unite with those of the field of the magnets, but if the poles are opposed the lines of force of the coil will be reduced proportionately to the magneto-motive force. But in this position no motion will be created, as the lines of force will be in parallelism. Between these two extremes another position may be assumed, where the coil and the armature is at an angle of 45 degrees with reference to the horizontal and vertical positions before assumed, and the mag-

netic field of the coil is at right angles to the coil. Here the position of the poles of the coil field is such that movement of the armature must follow, and a strong impulse is manifested, for it is only through moving the coil that the lines of force of the coil can establish parallelism with those of the magnetic field.

From this statement it is evident that slightest variance from the parallel position of the lines of force will impart movement to the armature, and it follows that there is a constant tendency of the lines of force of the magnets, which have a fixed relation as to influence, and those of the armature coils, to parallel when the latter are in certain position with regard to the magnetic. Perhaps a more simple manner of expression might be to state that there are permanent magnets that generally have a uniform influence, and a number of electro-magnets that may be moved, the fields of the latter having a tendency to reach such positions that their lines of force will be parallel with and in the same direction as those of the former. Consequently, as the current is increased, there is attraction of the movable electro-magnets of the armature coils by the permanent magnets, proportionate to the current. The torque of the armature then becomes merely a matter of magnetic field and the current in the armature.

The Alternating Current Dynamo.

The alternating current dynamo or motor is built with the windings of the armature connected with the collecting rings, and the direct current machines are constructed with the windings connected with the commutators. In usual practise the armature may be either the drum or the ring type, the drum being built on a spindle or a sleeve that is carried on a spindle, the ring being supported by a spider. The drum type is regarded as very desirable construction. The drum armature is built of a series of circular plates of soft sheet iron that are insulated by enamel or varnish, the plates being forced into contact to make practically a solid cylinder. In the peripheries of these plates are notches, and the discs are so placed when assembled that there are channels or grooves extending the length of the armature.

The number of channels is carefully determined, for the danger of eddy currents decreases with the increase of the number of the grooves. The production of eddy currents causes heating and perhaps other complications, and it is essential that this danger be minimized so far as possible. Soft iron plates are used for the core that

there may be a high degree of magnetic permeability, for the lowest resistance of the armature is necessary to insure the use of minimum current when performing a given work.

The Armature Windings.

The windings are sections of rectangular section copper wire with two turns on each side and one end of the coil, and a single turn at the other end, the free ends of the wire being soldered to the commutator. These windings are shaped on forms and are usually insulated with cotton fabric covering. The power of the machine depends upon the character of the windings, and what has been stated is the simplest form of construction. Over the first series of coils the second series is placed, and the channels are filled with the insulated windings. The coils are so placed that the ends are generally at right angles to the shaft of the armature, and the sides are separated a considerable space, each coil being in exact relation about the periphery of the armature. The free ends of the coil wires are soldered into slots in the ends of the commutator segments and insulation is placed between the commutator connections. The coils are retained in the grooves by windings of wire that are soldered and sweated to make solid bands, for these must resist the centrifugal force of the rapidly revolving armature.

Construction of the Commutator.

Commutators vary in design, but the principle of construction is the same. They are generally constructed of a series of L shaped copper pieces that are placed with the longest arm longitudinal, and with a wedge-like formation which is thickest at the "toe" of the L and thinnest from the "heel" to the top of the longer section. The thin edge of the L is cut so that when placed in a collar of insulating material there is a substantial ring or flange of triangular shape at either end to retain it. The short arms of the segments are connected with the insulator disc at the end of the armature drum. The segments are separated by sheets of mica that insulate them from each other. Each segment is a point for connection between two sections of the armature winding.

When the armature is wound it is saturated with an insulating compound, so that every void of the fabric about the coils and the channels is filled and the insulation is baked until it is thoroughly dried, this insuring protection against moisture, oil, dust and perfect circuits through each series of wire from one commutator segment to another. Extreme care is taken that each armature shall exactly balance, and this is accomplished by drilling the plate retaining the

core or by adding to it. When the commutator is completed the mica segments are cut to a depth of 1/16-inch below the surface of the commutator. The windings of the pole coils are subjected to a vacuum method of impregnation that insures they are thoroughly insulated, and they are practically solid.

Field Pieces and Coils.

The pole pieces and the field coils are bolted to the case or frame of the motor, there being two or any multiple of two poles and coils, and the armature is usually mounted in annular ball bearings that are carried in the end plates of the frame. The bearings are protected by caps that retain the lubricant. The brush rigging consists of a brush holder yoke that is generally bolted to two lugs within the frame or case, and this supports the brush holders. The brushes are usually of fiber graphite and are rectangular in shape, with flat ends that contact uniformly with the surface of the commutator, there being a spring pressure of approximately 3½ pounds to the square inch of brush contact surface. The lugs are drilled so that the brush holder yoke may be set about 1/8-inch from the commutator surface, and there are two positions, so that the machine may be operated clockwise or counter-clockwise, by shifting the brush to the other possible position.

This is a general description of the construction of a dynamo, and in the testing of these the machines are driven as motors and generators, to determine whether they have met all the requirements.

(To Be Continued.)

SERVICE MANAGERS ORGANIZE.

Automobile Factory Service Managers of Indiana is the name of a new organization recently formed at Indianapolis. The object of the association was stated as being: "To improve and facilitate co-operation between automobile manufacturers, dealers and owners in obtaining a maximum service in a fair and business-like manner to the mutual advantage of all concerned. The principal means of accomplishing this purpose shall be the holding of meetings for the reading and discussion of papers and reports on various service problems common to automobile manufacturers and by social intercourse among members."

Accessory and parts manufacturers' representatives, as well as automobile manufacturers, are eligible to membership. H. W. Drew, of Nordyke & Marmon, was elected president; E. W.

Cotton, of the McFarlan Motor Car Company, is vice president; W. D. Smith, service manager of the Cole Motor Car Company, was chosen secretary-treasurer. The following took part in forming the organization: O. W. Williams, Interstate; R. J. Elston, Westcott; C. W. Swain, Empire; W. E. Conover, Premier; J. O. Myers, National; E. W. Cotton, McFarlan; F. T. Seeds, Lexington-Howard; E. T. Klee, Stutz; W. D. Smith, Cole; H. R. Perry, Haynes; H. W. Drew, Marmon. C. R. Lester, service manager of the Packard Motor Car Company of Detroit, was a guest.

KISSEL TALKS ON ANNOUNCEMENTS.

While some manufacturers think that mid-summer is the proper time to announce new models and others, along with many dealers, favor the time of the big national motor shows at the first of the year, President George A. Kissel of the KisselKar company, has declared himself opposed to either view.

"The time to announce a new model is when it is ready, regardless of the season," he says. "When the manufacturer feels that he has evolved improvements or refinements that will better his car he ought to give the public the benefit as quick as it can be done consistent with thorough preparation for a first class job."

HERFF-BROOKS CARS SHOW WELL.

In a publicity run made recently near Harrisburg, Penn., Herff-Brooks cars made a remarkable record, finishing a run of 409 3/10 miles without a stop of any kind. They went into the receiving station 16 minutes ahead of time. Three machines of a make selling at more than \$2000 received broken springs; two other cars had burnt out bearings; another a broken steering gear. In fact, the casualties were so large that nine cars out of 66 failed to finish at all and four men were hurt, one of them seriously.

AVERAGED 21 MILES PER GALLON.

The 105 sixes which Saxon dealers recently drove away from the factory in an economy test, made 26,377 miles, at an average gasoline consumption of 21 miles per gallon, and 52 miles per quart of oil. The cars were equipped with Rayfield carburetors. This is one of few cars selling at a low price which is equipped with the Rayfield carburetor.

ARMIES PREFER GEAR DRIVEN TRUCKS.

Subsidies granted by the British government to owners of trucks that might be called upon for use in war were given on specifications that required the use of a gear drive instead of side chains, and this is regarded as encouraging by American makers of internal gear drive trucks.

The Engineer, an English technical authority, has the following to say regarding the reasons underlying that phase of the army specifications.

"A careful study of the regulations indicates that in only one essential feature of design is the liberty of the designer interfered with—a chain drive is barred on any vehicle which is to earn the subsidy. The reason for this is a military one. On active service the work which the lorry has to do is very severe on wheels and tires and wheels must therefore be able to be removed and replaced in the least possible time. In a gear driven vehicle the wheel can be taken off by the removal of a few nuts.

"It is equally simple to replace it. In a chain driven vehicle there are difficulties in the matter of worn chain sprockets and stretched chains to be allowed for. On the score of the ease of replacement of the back wheels the gear drive is therefore preferable. This does not matter in the least to the owner, as he gains the same advantages, although they may not be of the same value to him. The worst that he has to suffer is the sacrifice of some personal predilection in favor of the chain drive, derived, perhaps, from lengthy and satisfactory experience with this form of drive."

FRENCH FACTORIES CATCH UP.

French motor car factories have so far caught up with the demand of the French army for motor vehicles that they have been able to release a small number of cars to the public. One of the first results is to be the restoration of 'bus service in Paris.

Some 'buses are already running and others will be restored as rapidly as the cars become available. Six of the main lines have been selected by the commission in control of the matter to be restored first, and upon these 98 new 'buses will be in operation during the next few weeks.

This is about half the number of 'buses that were operated on these lines before the war began, but it is regarded as sufficient to care for the

present traffic. It will give service on a headway of 3½ to six minutes on the various lines. As soon as these lines have been equipped with 'buses it is probable that additional ones will be started.

ENGLISH COMPANY BUYS MOTORS.

Indications have been plentiful of late that English manufacturers, hopeless of meeting American competition permanently by their own small scale production methods, were about to experiment with buying American parts for assembly in England.

The Morris Oxford Motor Car Company, a well known maker of English light cars in Oxford, has contracted with the Continental Motor Manufacturing Company for a large number of small motors which have been designed to meet their requirements.

The motor is very small, but of high speed, and it develops a brake horsepower which may make it applicable to use in American cars. It is an L head, monobloc, four-cylinder type, with cylinders and top half of the crank case cast integrally. The cylinder head is detachable, permitting ready access to valves and pistons. Four supporting arms are built on the crank case and provision is made for a unit power plant construction that will accommodate several of the standard transmission and clutch units. Bore is 2¾ inches, stroke four inches, giving a piston displacement of 95 cubic inches and a rating of 12.08 horsepower by the S. A. E. formula. The brake horsepower at 2000 revolutions per minute is 18. There are three main bearings, combination forced feed and splash system of lubrication, thermo-siphon cooling. Ignition will be by high-tension magneto. The motor complete weighs 270 pounds.

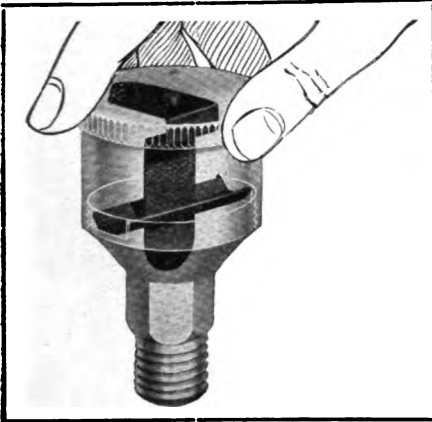
A weekly bulletin giving in detail the condition of the roads along the Pikes Peak Ocean to Ocean highway is issued by the association which has the interests of that highway in charge, and is sent free of charge to any one who may be interested in keeping in touch with conditions along the route. The national headquarters of the association are in Burns building, Colorado Springs, Col., and A. W. Henderson, secretary-treasurer, is in charge.

CAR ACCESSORIES AND EQUIPMENT.

KLICKET RATCHET GREASE CUPS.

A Grease Cup Which Produces a Loud Click, Letting the Operator Know Amount of Grease Forced Into Bearings.

Klicket Ratchet Grease Cups click when the caps are turned down a certain distance, letting the operator know at once how much grease he has forced into the bearings. This is accomplished by a strong interior ratchet, which produces the sound when the threads of the cap register with those of the cup. The sound is repeated at every $\frac{1}{4}$ turn. The ratchet locks the cap to the cup and thus prevents the annoyance of lost caps. To emphasize its faith in this feature of the device the company guarantees to replace free of charge any part of the cup that is lost or broken. Grit and dirt are prevented by the locking of the cap from working into the bearings. The device is designed to make it impossible to cross threads, and there are no outside springs. The cups are made to fit any car and may be obtained in steel, dull brass, polished brass and nickel plated brass. It is made by the American Stamping Company, Battle Creek, Mich.



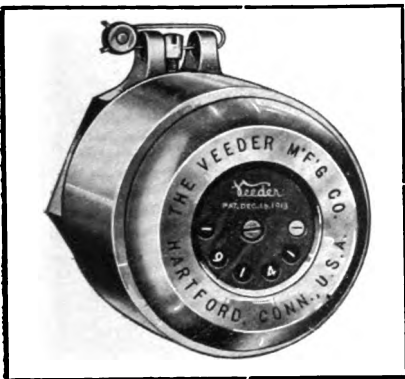
Klicket Ratchet Grease Cup.

tees to replace free of charge any part of the cup that is lost or broken. Grit and dirt are prevented by the locking of the cap from working into the bearings. The device is designed to make it impossible to cross threads, and there are no outside springs. The cups are made to fit any car and may be obtained in steel, dull brass, polished brass and nickel plated brass. It is made by the American Stamping Company, Battle Creek, Mich.

VEEDER HUB ODOMETER.

Attached to the Front Wheel Hub It Records the Distance Travelled Either Backward or Forward.

In the accompanying illustration is shown the Veeder hub odometer, form K, which is made by the Veeder Manufacturing Company, Hartford, Conn. This instrument is a positive mileage recorder and registers distance travelled either backward or forward, thereby preventing any one from subtracting mileage by jacking up the wheel and spinning it in a reverse direction. The device is usually sealed when installed, so there is no way in which it can be tampered with without the owner's knowledge. There are five



Veeder Hub Odometer.

dials indicating miles and one showing tenths of miles. This makes it possible to record as high as 100,000 miles, at which point it automatically releases itself and starts to register from zero. The odometer may be attached to any wheel that runs on a stationary axle, but is usually applied to the front of the car. Parts subjected to the

hardest wear are made of hardened steel, and the exterior case is made of drawn brass and is very heavy. The instrument is furnished complete with instructions for installation for \$20. The company requests that when ordering, the name, model, year of manufacture of the car and size of wheel be given.

WESTON AUTOMOBILE AMMETERS.

Widely Known Electrical Company Produces Ammeters for All Makes of Motor Cars.

Ammeters for all makes of motor cars are being produced by the Weston Electrical Equipment Company, Newark, N. J., a corporation with a world wide reputation as a manufacturer of electrical instruments. As practically all modern and many earlier cars are equipped with generator lighting and starting systems, it is important that the driver should know at all times whether he is storing current away in his battery or is drawing upon the supply already stored there. In the accompanying illustration is shown ammeter No. 354, flush type, which will operate successfully on any starting or lighting system, either one or two-unit, except those in which the lighting and charging circuits are not separated from the starting circuit. It retails at \$4.25. This device fastens to the front dash and always shows the driver the amount of current which is being charged into or discharged from the battery. If the pointing needle remains stationary it is a sure sign that the generator is not running. An attractive discount is given to garages on all Weston models. Literature fully describing other useful garage products is sent on request.



Western Model 354 Flush Type Ammeter.

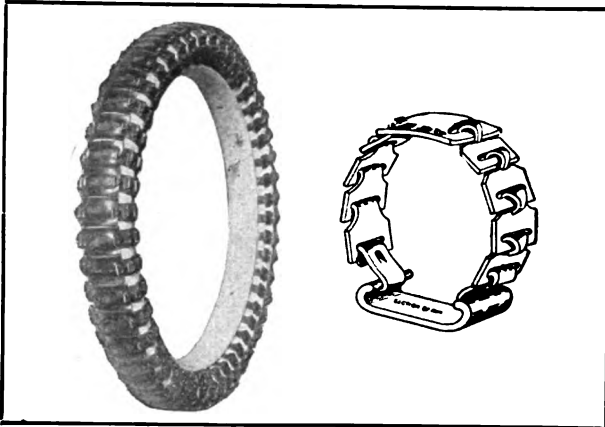
KIMBALL STEEL TIRE ARMOR.

Steel Links Encircle the Shoe and Make It Both Blowout and Puncture Proof.

In an effort to reduce tire costs and enable owners to get good service from tires that would ordinarily be considered as worn out, the Kimball Tire Case Company, 166 Broadway, Council Bluffs, Ia., is manufacturing a steel tire armor that can be fitted on either new or impaired casings.

This armor is made up of flat steel links hooked together and secured to the wheel rim in the same way as a tire. Each section is two inches wide at the tread plate, and it only requires 50 links to completely encircle a 32-inch tire. The steel is one-eighth of an inch in thickness. To prevent skidding the tread plates are corrugated. Each link will stand a strain of 2000 pounds. When placed about a blown-out section of the tire it holds very firmly.

Discarded casings encircled by these plates are expected to render long service. Rings are supplied so that the plates can be fastened to other types of tires than



Tire Encircled with Kimball Steel Armor and Kimball Steel Armor Plate.

clinchers. The price of the armor is moderate. An inquiry sent to the manufacturer in which this journal is mentioned will bring full information.

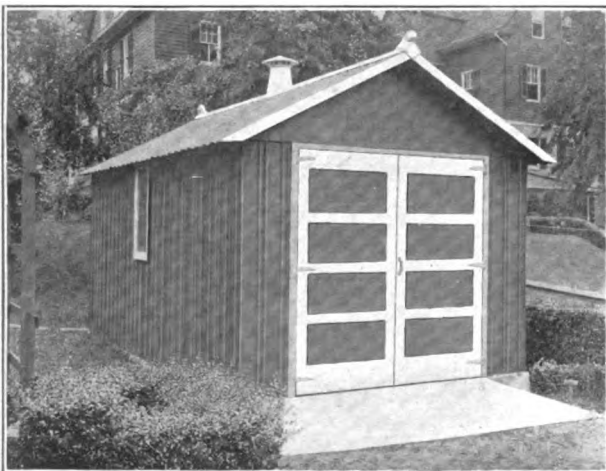
PRUDENTIAL PORTABLE GARAGES.

Sectional Galvanized Steel Garage Which Affords Several Conveniences and Can Be Erected Expeditiously.

Storage for the automobile at economical cost is a problem that has perplexed many motorists. One inconvenience is that while vehicles are stored in public garages the owner is not generally permitted to repair, wash and do the several other necessary things that he might wish to do about his car if he had it in a private garage.

The galvanized steel portable garage illustrated is the product of the C. D. Pruden Company, Baltimore, Md., and it offers all the conveniences a car owner could desire. Aside from this, it is mechanically correct, economical and will prove ornamental in any location.

The garage is shipped in sections, which can be erected expeditiously by any one. An advantage of a portable building of this kind is that if the owner changes his residence he can readily pack up his garage and trans-



Prudential Sectional Galvanized Steel Portable Garage.

port it easily to the new location.

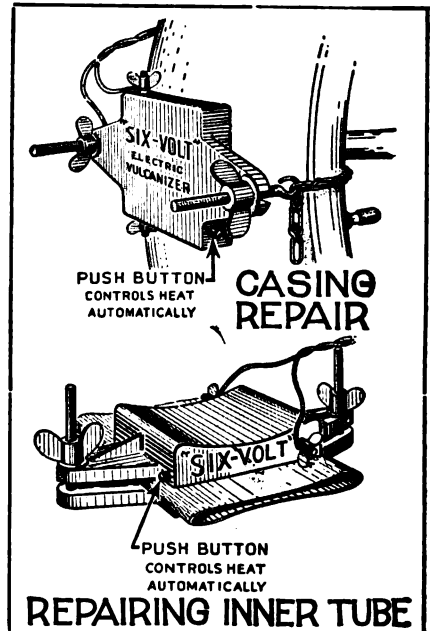
The Prudential garage is absolutely fire and thief proof. They can be obtained in any practical size, or can be made to specifications.

SIX-VOLT ELECTRIC VULCANIZER.

Heat Regulates the Electric Current in Such a Way That the Rubber Cannot Burn or Become Overcured.

A portable six-volt electric vulcanizer is being manufactured by the Premier Electric Company, 4041 Ravenswood avenue, Chicago, for which it is claimed that the tubes or casings

cannot be burned or overcured, as the current is automatically controlled by the temperature that is created. The moment the heat required to vulcanize the patch has been attained the current is at once shut off. Simplicity and ease of operation is an important quality of the device, as all that is required is to attach it to a six-volt battery of the kind that is carried in most modern cars, apply it to the tube or casing and then press a button. It is stated that the thermostatic cut-out is capable of several hundred operations before it finally becomes exhausted. As this equipment weighs approximately only two pounds and is small and compact, it is easily carried in the tool box of the car. Repairs on either inner tubes and casing up to five inches in diameter can be made. The outfit is furnished complete with 10 feet of flexible connecting cord, repair gum, cement, scissors, casing, tire tool and wax paper for \$3.50.



Premier Electric Vulcanizer.

INSIDE BLOW OUT PATCH.

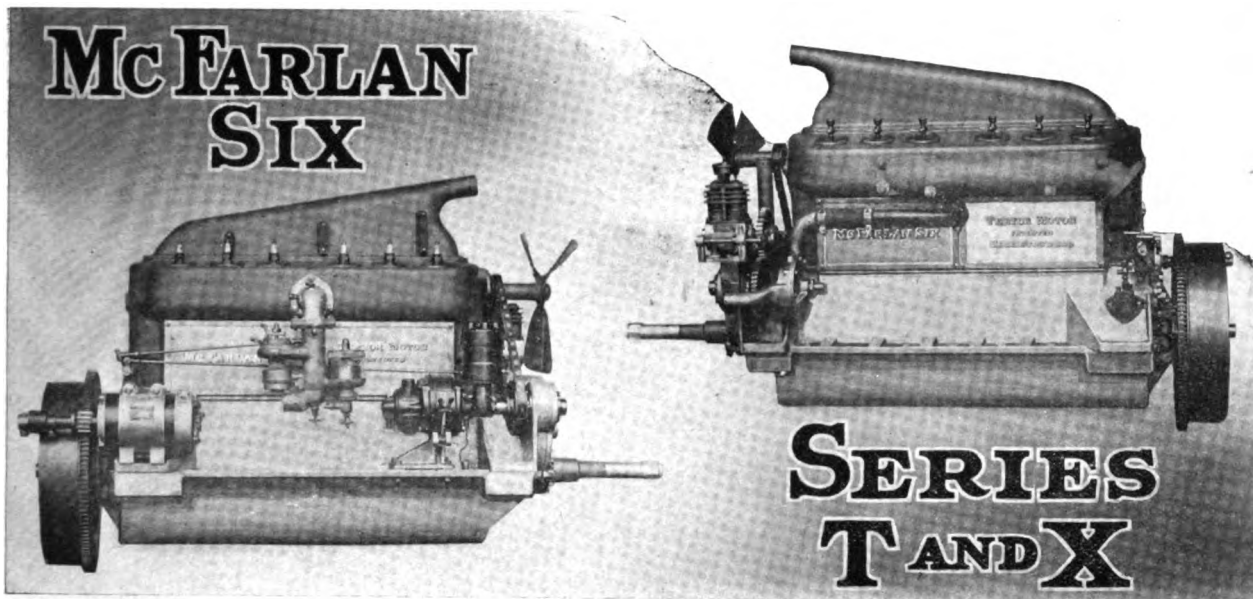
Fine Friction Fabric Applied with a Special Flap for Protecting the Tube from the Rim.

The tire repair patch shown in the illustration is produced by the Twentieth Century Tire Protector Company, Midlothian, Tex. This patch incorporates a locking device in its construction. It is designed to restrain the inner tube and reduce the section to a little below normal, thereby preventing bulging at the point where the shoe is broken. These patches are made from several plies of fine friction fabric with a special flap for protecting the tube from the rim. The patch is designed to



Repair Device for Inner Tubes.

effect a repair of any sort of tire injury and is said to be strong enough to hold even though the tire be cut away from bead to bead.



TWO McFarlan Sixes, announced for 1916, are identical in all details except that one has $4\frac{1}{2}$ -inch bore and six-inch stroke cylinders, while the other has four inch bore and six-inch stroke. The price this year is \$90 higher for each model, \$2990 for the car with the larger motor and \$2680 for the smaller.

In general design the motors are similar to those that have for a long time been used in McFarlan cars. These have been T head cylinders, cast en bloc, and a short crankshaft with four large main bearings. The centre bearings are $2\frac{3}{8}$ inches diameter and the end bearings $2\frac{1}{8}$ inches diameter.

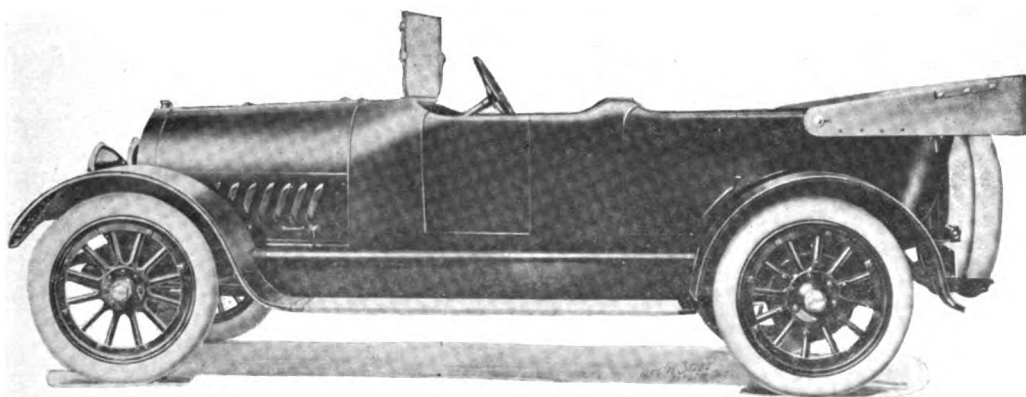
Aluminum pistons are used this year and the reciprocating parts have been much lightened, increasing the speed of the motor about one-third. For this reason the main bearings have been equipped with a pressure feed oiling system with a pump driven off the exhaust camshaft. The automatic variable lever splash system has been continued for the lubrication of the crankshaft bearings and the cylinder walls.

The water pump, which was formerly cast integral

with the crank case, has been converted into a floating type, so that if it is damaged in any way repair is a much easier matter than in previous types. The ignition current is supplied by a Westinghouse generator-battery system.

The cone clutch is similar in design, but a pressed steel cone has replaced the cast aluminum cone formerly employed. The transmission gearset is no longer carried on the rear axle, but is mounted on a sub-frame in the middle of the main frame. All gears are of $3\frac{1}{2}$ per cent. nickel steel and the diameter of the squared shaft has been increased to $1\frac{5}{8}$ inches. The gearset shafts are mounted on annular ball bearings.

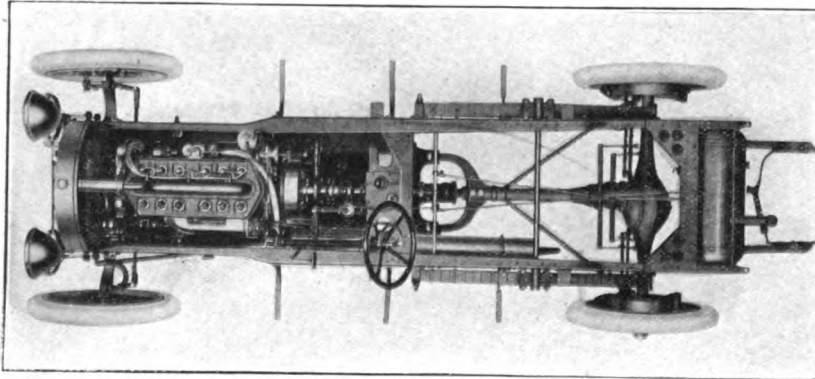
A full floating rear axle is employed. The axle casing has been changed to pressed steel to increase the strength and cut down the weight. The nickel steel shafts are $1\frac{1}{2}$ inches in diameter. The wheel bearings are a double row of annular balls.



McFarlan Sixes, Series T and X, Are Equipped with Six and Seven-Passenger Touring, Four-Passenger Submarine or Touring Roadster Body Types.

One of the most striking innovations is the new continental type of cantilever springs. These are quite similar to those used on the English

greater accessibility to the valve covers is obtained. The appearance of the assembly has also been enhanced.



View of McFarlan Chassis, Showing Constructional Details.

Rolls-Royce car, although there is a difference in the manner in which they are shackled.

The springs are not arched, as is usual with cantilever construction, and when under normal load they are quite straight. This gives the car remarkable riding qualities, owing to the slow return of the body after the springs have been depressed by passing over an obstruction.

The springs are shackled at both ends, a construction which is possible only when no driving torque is taken by them and they perform their single function as springs. These springs are exceptionally long and wide, the dimensions being 58 inches by three inches. They have 14 leaves.

It has been necessary to strengthen the frame, as is often the case when cantilever springs are adopted, and the reinforcement of the McFarlan frame extends from a point opposite the front shackle to the middle of the spring. The spring is fastened to the top side of the axle housing.

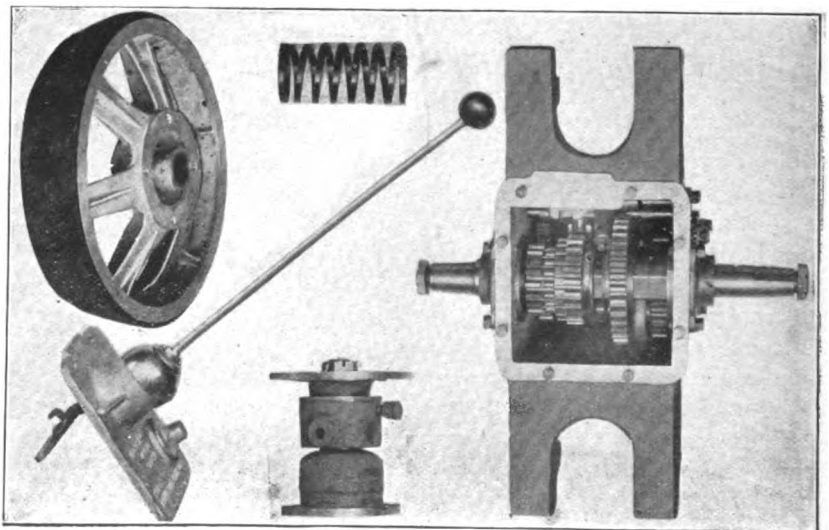
A Westinghouse starting, lighting and ignition system is standard equipment on the cars. The starting motor has been changed from the left to the right side of the engine and the motor pinion meshes with a fly-wheel ring instead of driving through a chain of gears to the crankshaft, as in previous models.

Both the starting motor and the generator have been lowered on the case and by this means

given a great deal of attention to body work. All bodies are designed and built in the McFarlan plant. There is a standard line of six and seven-passenger open and closed bodies, with roadsters as well.

In addition to this a special body department is maintained from which the purchaser may order any body design or finish that suits his fancy. Cars of standard colorings are kept in stock for quick shipment, but if the purchaser allows sufficient time any color treatment that is desired can be furnished at no extra cost. The same applies to the upholstery.

The changes made this year in the car afford a more accessible motor and one that has a higher crankshaft speed and consequently increased power. The frame construction has been made much more rigid without increasing its weight



Cone Clutch and Transmission Gearset Used in McFarlan Six.

In general appearance the car is quite similar to previous productions, although some marked refinements have been made. The radiator is higher than before and the side panels of the body have been raised. The result is an almost perfect streamline body, in which the passengers are carried much lower.

The McFarlan company was a carriage maker long before it took up building automobiles, and it has always

noticeably. The new spring suspension has improved riding qualities and the double cowl passenger bodies are handsomer than the former types.

MANY IDEAS FOR TIRE IMPROVEMENT.

The modern pneumatic tire is held to be a very unsatisfactory piece of goods by thousands of amateur inventors, who write to L. V. Rockhill, manager of the automobile tire department of the Goodyear Tire and Rubber Company. Numberless suggestions are made every year for building a non-puncturable and indestructible tire.

Most of them are submitted by persons who are unfamiliar with tire construction, many of whom have never operated a car. They are particularly taken up with the idea of preventing punctures and many suggestions are made to incorporate a metal tread or strip inside the tread in the belief that this would be effective.

Yet the tire experts find that only about 11 per cent. of tire trouble and expense comes from punctures, the rest arising from general wear. Each communication, however, is answered and the company's reasons for not adopting the suggestion are carefully stated. The writer is encouraged to write again and about one in 200 make suggestions that can be used by the Goodyear company.

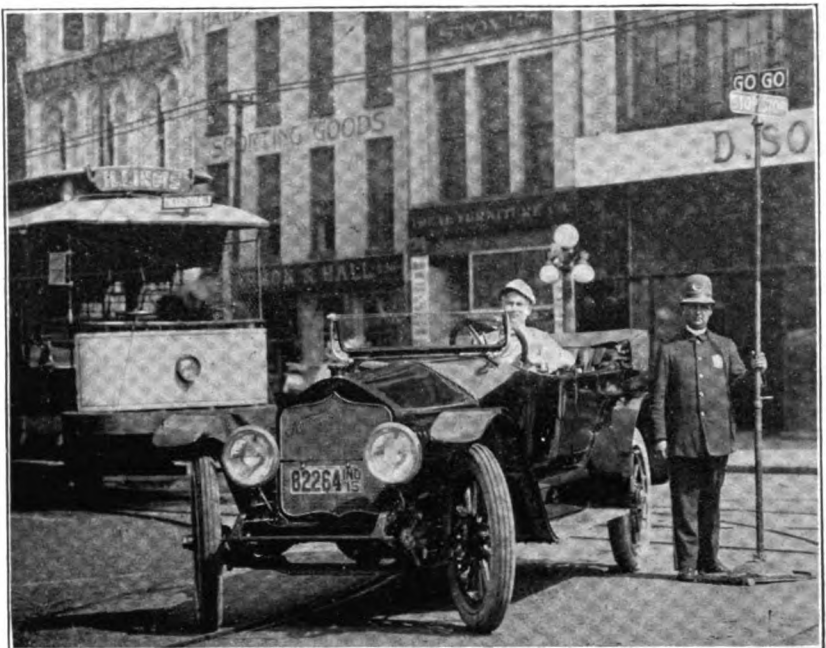
LOZIER CONTINUES OLD MODELS.

The Lozier Motor Car Company has announced that there will be no change either in design or price of the Light Four and Light Six models, which it has marketed during the past year. General Manager Samuel Frank points out that the policy of the company in not announcing new models yearly slows down the rate of depreciation on the Lozier cars that are already in the hands of users, and is a distinct advantage to present Lozier owners. The cars will be con-

tinued on the former Lozier policy of quality production.

KNIGHT ENGINE ADVANTAGES.

Greatly increased interest in the Knight motor has been caused by the announcement of the new Willys-Knight car. European experience of seven years with Knight motors has shown them to be of much longer life and to require less effort to keep in condition than poppet valve types. Paul Daimler, mechanical head of the Mercedes company and son of Gottlieb Daimler, inventor of the internal combustion engine, is a strong supporter of the sleeve valve engine. For



Indianapolis Adopts Semaphore in Traffic System.

a user in the farthest corner of Russia, where repairs and mechanics are not to be had, it would be the right motor, he declared once in a Vienna trade paper, because it needs so little attention. Carbon, which greatly interferes with the proper operation of the poppet valve motor, is unimportant in the sleeve valve, as it increases rather than decreases the efficiency of the motor, and most old Knight type motors have greater power than new ones.

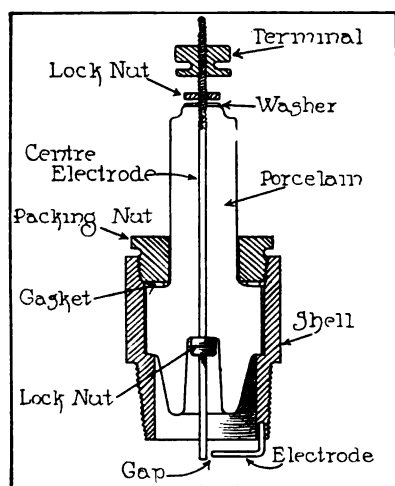
When ascending hills use plenty of speed, as this prevents pounding and saves trouble of changing clutch to a lower gear. If engine begins to pound change to a lower gear immediately.

SUGGESTIONS FOR THE FORD CAR OWNERS.

The Theory of Internal Combustion Engine Ignition by Opening and Closing a Circuit in the Cylinder—How the Current Is Supplied—The Induction Coil.

The 30th article dealing with the construction, operation, maintenance, care and repair of the model T Ford chassis is devoted to the consideration to the theory of gas engine ignition, how the current is supplied and the induction coil.

THE voltage rating of average dry cells is two, of the average lead-acid cell two, and of the nickel-iron-alkaline cell 1.2, while the amperage rating will vary decidedly. The voltage ratings stated are what may be termed accepted values, by which a battery of five dry cells would be rated at approximately 10 volts (if new cells), a battery of three lead-acid cells would be rated at six volts, and a battery of five nickel-iron-alkaline cells at six volts.



The General Construction of a Spark Plug, Showing the Essential Components.

One will note that with a battery of cells, such as is usually used for ignition purposes, the voltage will be very low, rarely indicating the full rating and often less than that. With the Ford chassis a battery of dry or lead-acid cells is frequently included in the

ignition system for starting and for a reserve. These may be four or five dry cells, generally of the size rated at two volts and 30 ampere-hours each; three lead-acid cells rated at two volts and 60 or 80 ampere-hours each, or possibly five nickel-iron-alkaline cells, rated at 1.2 volts and either 40 or 80 ampere-hours each.

Firing the Charge by Electric Spark.

In gas engine ignition the theory is to create an electric spark in the cylinder to be fired at the exact period when the explosive force will be most efficient in power production. This is done by having an electric circuit through the cylinder, and the spark is created by closing a circuit

that has been broken, causing the current to "jump" across an air gap, which is the space between the two points in the circuit where the spark is to take place. This air gap is for a number of reasons made in what is known as a spark plug, which is removable so that it may be easily replaced in the event of damage or deterioration, may be adjusted should there be variance in the potency of the current, or cleaned if it should become so burned, or so coated with oil or carbon, or so oxidized that it is partly insulated and the free passage of the current is obstructed.

Spark Plug Construction.

The spark plug is in practise a metallic shell, threaded for a portion of its length, to be screwed into a tapped hole in the cylinder. In this shell at the lower end is placed a metal point that extends toward the centre. Into the upper end of the shell is placed a porcelain or mica core, in the centre of which is a metal rod that is secured by nuts and packing against gas leakage, the lower end of which extends to and about the level of the metallic point mounted in the shell.

This core is formed with a shoulder on which is seated a gasket, and against which a packing nut or gland is screwed, making a gas-tight joint. The upper end of the rod in the core is fitted with a locking nut and a terminal nut. A very high voltage is necessary for an electric current to jump from the point mounted in the metallic shell to that in the centre of the porcelain core. These points are known as the electrodes of the plug. The space between them varies from 1/32-inch for the battery current to 1/64 for the magneto current. The resistance of the gap to the electric current is enormous, and as there are other obstructions as well to be considered, the voltage of the circuit must be greatly increased. This is done by the use of coils which will intensify the current to from 8000 to 10,000 volts. The voltage of the battery has been stated, and from either the battery or the magneto this great increase must be made. The reader should understand that the volt is a unit of measurement, which expresses pressure of an electrical current as pounds expresses the pressure of water or hydraulic system. The ampere is another unit that expresses quantity, as a gallon of water, for in-

stance, means volume or flow as used.

How Batteries Are Rated.

The battery rating is in volts and ampere-hours, which means that the stated voltage can be maintained theoretically for a definite period. That is, 40 amperes would mean that the battery would be expected to deliver a current of one ampere for 40 hours, or a current of 40 amperes for one hour. There is a distinct and rapid loss of amperage capacity as the period of discharge is decreased below the normal. With intermittent use, such as for ignition, a very small amperage and a very high voltage is necessary, and in such service a battery will afford high efficiency for a considerable length of time.

Theory of an Electric Circuit.

To create an electric circuit a path or conductor must be established. This is usually done with wiring and metal, or it may be through what is known as grounding. A circuit can be made through a single wire extended between two points provided the ends are in contact with conductors that enter the ground. This same principle is employed in gas engine ignition by having the ends of a wire or wires forming part of a circuit connected with a metal construction that will form the remainder of the circuit. This is illustrated in the accompanying diagrams.

In the Ford ignition system the current is taken at low-tension from the contact on the flywheel housing and it is conducted through a cable to a box containing a series of four transformer coils, and after passing through the coils is conducted to what is known as a timer, which distributes it to the four cylinders for ignition, and thence it returns to the magneto through the engine case. If a battery is used the current is taken from the battery through the coils and the grounds are at the battery, the spark plug and the timer, while in the magneto system the grounds are the magneto, the spark plug and the timer.

How a Circuit Is Grounded.

Any electric circuit, no matter what the length, may be made through the earth, and a current will manifest itself in the wire proportionate to the capacity of the source of generation. So long as the ground contacts obtain the current will continue through the circuit, but in

the event that there is another ground established, or a connection made with another circuit, then a part of the circuit will be abandoned by the current, which will seek the path of least resistance, and this will naturally be the shortest, all other conditions being equal. Such an event is known as a "short circuit"—that is, the original circuit is not completed. The circuits for the ignition system of the Ford chassis may be likened to that of the single wire and the earth in that the wiring that carries the current from the magneto to the coils, from the coils to the timer and from the coils to the spark plugs is heavily insulated to prevent the escape of the current, but the return of the current to the magneto from the coils, the timer and the spark plugs is through the engine case. Where the current is directed or carried to the coils, timer and spark plugs, its functions may be regulated or con-

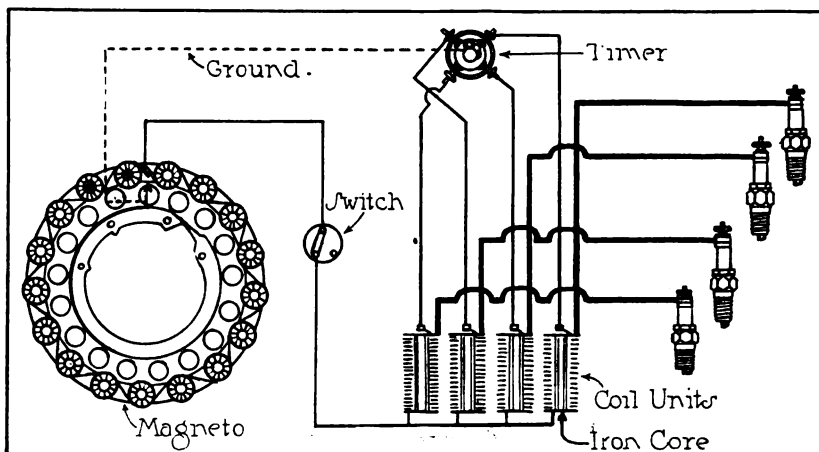


Diagram of a System Including the Elements Made Use of for Ignition in the Standard Ford Model T Chassis.

trolled, but the return is not governed other than to know that the path is clear and not obstructed.

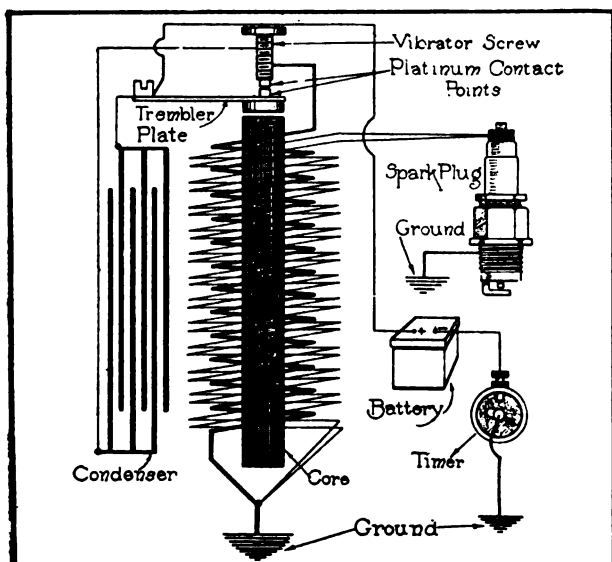
The Conductivity of the Wiring.

The reader should understand that practically every conductor of electricity resists the current to some extent, the resistance being dependent upon the metal, its size and the length of the circuit. The conductivity of metals differ greatly and copper is probably the most generally used material for wiring because of its low resistance. This resistance is carefully figured and can be accurately determined. Any wiring is not suited for a given circuit because of the differing necessities, conductivity, size sufficient for the current load and low resistance being essential factors, and should there be reason to replace any of the wire the replacement ought to be made with material of the same metal, length and size, and equally as well insulated.

The Theory of Electric Induction.

The process by which an electrical conductor or a magnetizable body becomes itself electrified or magnetized in the presence, but without necessarily actual contact of an electrically charged body, a magnet or a magnetic field produced by an electric current, is known as induction. Magnetization is an example of magnetic induction. Electromagnetic induction is the production of currents by the cutting of a conductor by magnetic lines of force, produced either by a permanent magnet, an electro-magnet or a current carrying conductor. Self-induction is induced currents in the circuit itself caused by changes in the magnetic field, and when in a neighboring circuit this is stated to be mutual induction.

Induced currents are produced whenever the



The Construction of a Standard Induction Coil and the Manner of Connecting it in the Conventional Circuit.

inducing current starts, ceases or changes direction or intensity, or whenever a current-carrying conductor is moved relatively to another conductor or conductors so as to cause its lines of force to cut the latter. The intensity of an induced current is proportional to the cutting of the lines of force, and its motions are always such as to oppose the motions which produce it. Mutual induction and self-induction are sometimes called electrodynamic induction. This briefly describes the principle that is the basis of the construction of the induction or transformer coil which is used to intensify the voltage of the current in the ignition system.

Construction of the Induction Coil.

The induction coil is constructed with a core that is composed of a number of soft iron wires

placed lengthwise. This core is insulated and on this is wound a number of turns of insulated copper wire. The number of convolutions of the wire is sufficient to cover the length of the core, and one or more layers are laid, according to the size and use to be made of the coil. This first winding is known as the primary, and there are terminals for the connection of the wiring. On this primary coil is laid a second layer or layers of very fine insulated wire, and the increase of the voltage by the coil is dependent upon the size and the number of convolutions, the greater the number of turns the greater the intensification. The efficiency of the coil is absolutely known and can be determined to a very minute unit. The second coil is known as the secondary winding, and this is also provided with connections to the wiring.

The lower ends of the primary and secondary coils are connected and grounded. The upper ends of the secondary winding are carried to a terminal to which is connected the wiring that carries the current to the spark plug. The upper end of the primary winding is attached to the block that carries the screw by which the vibrator blade is adjusted. The vibrator blade is mounted so that when at rest a platinum contact stud on the upper side contacts with a similar stud on the end of the adjusting screw. On the under side of the blade is a metal button that is of the same diameter as, and directly above, the core of the coil. The blocks on which the adjusting screw and the vibrator blade are mounted are connected with the condenser. The vibrator blade block is fitted with a terminal by which connection is made with the timer.

(To Be Continued.)

NEW ROAD AT WEST POINT.

Commissioner Edwin Duffy of the New York state highway department received bids July 25 for a road that will go around Storm King and Crow's Nest mountains and through the United States Military Academy grounds at West Point to connect with the present highway from the village. This will be 16 feet wide of bituminous macadam. The state engineer's estimate of the cost is \$327,591. The average cost per mile will be \$100,000, as compared to \$180,000 per mile of the first estimate, which was rejected because appropriations available were not sufficient for the purpose.

Let thy muffler remain closed, for the muffler oft proclaims the man.

COFFIN AND RIKER ON NAVY BOARD.

HORACE E. COFFIN, vice president of Hudson Motor Car Company, and Andrew L. Riker, vice president of the Locomobile Company of America, have been chosen as the two representatives of the Society of Automobile Engineers on the civilian advisory board of the United States navy.

Both are past presidents of the Society of Automobile Engineers and were chosen from among nine prominent engineers who accepted nominations before the election held by the society. Mr. Riker was the first president of the society and served in that capacity for three terms. Mr. Coffin became president in 1910.

Mr. Coffin was educated in the engineering department of the University of Michigan. He served five years in the United States postal service. From 1902 to 1903 he was chief of the experimental department and chief engineer of the Olds Motor Works. In 1906 he was chief engineer and vice president of the E. R. Thomas Detroit company and later was chief engineer of the Chalmers company. He produced a steam propelled automobile in the early days.

Before the Society of Automobile Engineers was organized its present work was taken care of by the mechanical branch of the Association of Licensed Automobile Manufacturers. Both Mr. Coffin and Mr. Riker were directing officers of that organization.

Mr. Riker is an electrical as well as a mechanical engineer. As early as 1888 he worked on electric motors with a view to developing a type suitable to vehicle propulsion. The Riker Electric Motor Company produced the first toothed armature. Electric vehicles were produced after 1894 and later heavy trucks were built. He designed in 1890 the lightest and most compact lighting systems for marine work. He has been vice president of the Locomobile Company of America for 13 years. In 1906 he built racing motors with 7¼-inch bore and six-inch stroke. One of these cars won the Vanderbilt cup race in 1908. Mr. Riker has developed many patents. In 1900 he was honored by the French government for meritorious automobile design.

FRENCH AVIATRICE SELLS AUTOS.

Announcement has been made that the Chalmers representation for all of France has been taken over by Helene Dutrieu, who is internation-

ally known as an aviatrix. She is entitled to wear the ribbon of the Legion of Honor.

During the war she was stationed at the government hanger in Paris doing aeroplane scout duty. During the battle of the Marne she drove a Red Cross ambulance between the battle front and Paris. Later she had charge of an annex to the Val de Grace, a Paris military hospital.

She recently visited the Chalmers factory in Detroit, accompanied by G. J. Klyuskens, her interpreter and financial agent. In 1911 she won a cup offered by the King of Italy for an air meet at Florence in competition with 15 of the world's



Helene Dutrieu, Who Represents Chalmers for All France.

greatest aviators, including Vedrines and Tabuteau. She was the only woman to compete. In February of the same year she received the gold medal of the Aero Club of France from the Minister of Commerce and Labor, the highest distinction for aviators, and in 1913 was made a Chevalie de la Legion de l'Honneur.

A KisselKar has been selected as the official car for the Elgin road races. David Beecroft will referee the event and will be driven about the course by Harry P. Branstetter.

Do not allow motor to run at full speed when standing, as this puts extra strain upon many parts of the engine, causing unnecessary wear.

SURVEY OF ROAD MAKING MATERIALS.

TO SELECT the best type of road that can be built most economically in each locality, the New York state highways department has made a state wide survey of available materials, their location and the qualities they show under test.

The commission was planning recently to build a road in a certain part of the state. The nature of the traffic was known and concrete was looked upon as a desirable surface. There was some question, however, as to whether materials could be found at hand to make that pavement.

A memorandum was sent to the testing laboratory of the commission, where the results of the survey are kept, asking for information on materials. In a few minutes a report was received that stone suitable for concrete could be secured at a certain place near the proposed construction and sand at another. This sand had shown poor results when used in its natural condition, but when washed had produced concrete of the highest quality.

So the commission was in a position to decide at once upon a concrete road and specifications were prepared on that basis.

The whole area of the state has been covered by this survey and a large chart has been prepared, showing the location and character of the material supplies in such a way that they can be located at a glance.

Cheapness and availability of materials is always an important point in the selection of a type of road and in the expenditure of an appropriation of \$10,000,000 annually accurate information on that subject may save a vast amount of money. The state material survey is a step that is urged by good roads workers upon other state highway commissions.

ROAD MARKERS FOR MASSACHUSETTS.

The great number and variety of the road markers that are being placed in all of the main travelled automobile routes promise soon to relieve tourists in a strange section from the necessity of referring constantly to guide books. The Massachusetts State Highway Commission has undertaken the task of erecting markers on the main roads of the state and by the end of the summer most of them will be in place.

The system used consists of painting different colored bands around telegraph and other poles,

fence posts, or trees near the corners where motorists might be in some doubt as to the roads. The colors are red for the main east and west routes, blue for the main north and south routes and yellow for the secondary routes. So far only the route from Boston to Pittsfield, via Worcester and Springfield, and the route from Fitchburg to Greenfield have been marked, but all the main roads will soon be covered.

ROAD IMPROVEMENT IN KANSAS.

Kansas has a very live good roads movement, which was inspired largely by the farmers becoming convinced that good roads mean large economic benefits to them. Some very important work has been done during the past few years. Discussing the condition of Kansas roads today, as compared to a few years ago, A. Q. Miller, secretary of the Rock Island Highway Association, has this to say:

"Five years ago there was little or no interest in good roads in Kansas. State Highway Engineer Gearhart is authority for the statement that it is a conservative estimate that where there was a mile of graded, well dragged road in Kansas five years ago, there are 10 today—and this improvement has been made without increasing road expenditures.

"Five years ago there was not a mile of cross-state road; today there are more than 2500 miles of such highways. This state has 111,536 miles of road, 10 per cent, or 11,267 miles, of which have been designated as county road. Five years ago there were not to exceed 500 concrete culverts and 50 concrete bridges in the state; today there are not less than 5000 concrete culverts and 500 concrete bridges. Five years ago it would have been hard to find within the state five to 10 consecutive miles of improved road; now trans-continental motorists are crossing the state on a half dozen improved and marked cross-state highways.

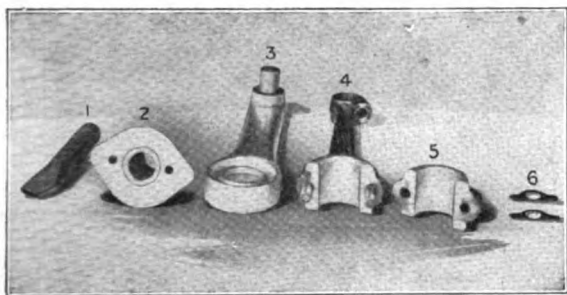
"This, in brief, shows something of the remarkable growth and development of the good roads movement in Kansas during the past five years. With such strides as these what may we reasonably expect at the end of another decade? Public opinion has been crystalized into a realization of the need of good roads not for automobiles, but as an economic proposition in the marketing of farm products."

FORD CAR ACCESSORIES AND EQUIPMENT.

H & P BABBITTING JIG.

Outfit That Affords Large Profits to the Garage Operator and Maximum Service to Car Owner.

The H & P jig for the babbitting of Ford car connecting rods, the product of the Hanten Machine Company, Watertown, S. D., will enable the repairman to do



Units of the H & P Babbitting Jig.

such work quickly and in a highly efficient manner, and will enable him to reduce the cost to the car owner.

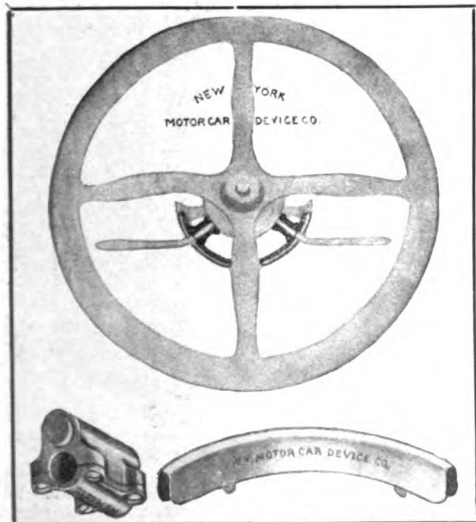
The illustration shows the several components of the outfit. No. 1 is a heating pin, which is brought to a white heat and placed in the hollow mandrel, shown at No. 2, when babbitting. This prevents the rapid chilling of the metal and insures satisfactory results. No. 3 is the bottom half of the jig and shows the end pin that fits the wrist pin bushing and holds the connecting rod securely in position. Nos. 4 and 5 show the connecting rod and cap babbitted in place. At No. 6 is shown the shims used between the rod and cap to form a division between the two and to insure an equal quantity of metal on both sides.

TWO HIGH QUALITY SPECIALTIES.

Fan Belt Adjuster for Maintenance of Constant Tension and a Friction Gas and Spark Control.

Two Ford car specialties of unusually exceptional merit are made by the New York Motor Car Device Company, 117 East 27th street, New York City. They are the Premo fan belt adjuster and the Premo friction gas and spark control.

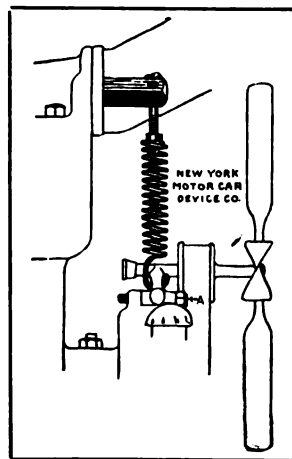
The belt adjuster maintains a constant tension, which prevents the belt from slipping or from falling off. When correctly installed the adjustment is absolutely



Premo Friction Gas and Spark Control and Components.

handsomely nickel plated, permanent. The device, can be attached in about five minutes. Installation requires that only one bolt be replaced by a special bolt, which is supplied. The retail price is 50 cents each.

The Premo friction gas and spark control is designed to fit over the worn teeth of the quadrant of the Ford car and to afford a friction contact. Polished brass collars fit over the teeth and friction attachments are secured to the levers. With this device the operator is afforded the advantages of friction control. Installation is accomplished in about 10 minutes. The device retails at \$1. The company will furnish further information to writers who mention this magazine.



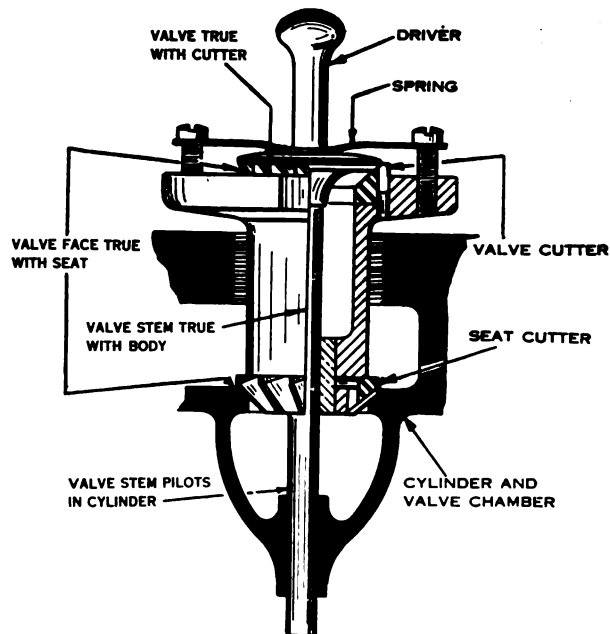
Premo Fan Belt Adjuster.

USE-BULL COMBINATION TOOL.

New Principle of Cleaning, Truing, Grinding and Reseating Both Valve and Valve Seats in One Operation.

The Hughes Bull Company, 1038 Hancock avenue, W., Detroit, is marketing a tool that combines two cutters, so arranged as to perfectly true both the valve face and seat in one operation, without disassembling the motor. Absolute alignment is assured by the valve stem fitting in its guide and acting as a pilot for the tool. The tool is also provided with a centering means. The illustration shows that the relationship of the two cutters can only insure a perfect alignment.

The tool is the result of exhaustive experiments. The cutters are made of the best high carbon steel, the teeth



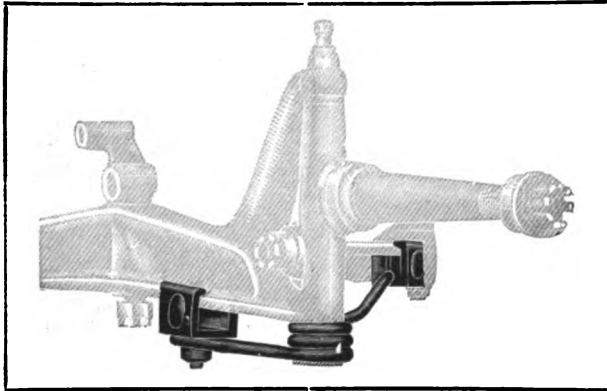
Use-Bull Truing, Cleaning and Grinding Tool.

being of a special design and it is declared that it is impossible for them to produce chatter marks. When dull they can be easily reground. The operating handle is made of aluminum and the tools are made in sizes to suit any type of motor. A special type is adaptable to all or any size of valve and seat, and has a special operating arrangement whereby either cutter may be used simultaneously or independently. The Ford size retails at \$5, while the one adaptable to all sizes sells at \$5.50.

CASTER SPRINGS.

Springs That Reduce Wear Upon Steering Pivots and Joints and Maintain Car's Course.

Ford drivers are aware that nearly every uneven portion of the road and every obstacle passed over can be felt at the steering wheel. This is due to the reversible



Miller Caster Springs Installed on a Ford Axle.

or rack and pinion type of steering gear and requires that the operator shall maintain a firm grip on the wheel.

To minimize this, the Miller & Co., Spring Valley, Ill., is manufacturing a caster spring. One end of the attachment clamps to the steering knuckle arm and at the other to the lower flange of the axle. The coil part of the spring fits over the steering knuckle bolt nut. The accompanying illustration shows that the front wheels are consequently held in a straight position and are not easily deflected by stones, ruts, etc. The company declares that when the springs are correctly attached, the operator can with absolute safety permit the car to run without placing his hands on the steering wheel. The springs are finished in black enamel and retail at \$5 per set. When once installed no further attention is necessary. Every part is guaranteed against defective material and workmanship. The company will replace free of charge any part that proves to be defective.

APCO VALVE GRINDER.

A Tool for Ford Cars That Offers Several Advantages in Grinding Cylinders.

Ford car repair men and car owners who have attempted to grind the cylinders of the Ford motor will appreciate the virtues of the valve grinding tool, made by the Auto Parts Company, Providence, R. I.

The tool differs from conventional types in that it is provided with a universal joint to compensate for any misalignment when rotating the tool. The size of the tool is such that it can be operated with ease on the fourth cylinder of the motor, which is partially concealed under the dash, and the weight is sufficient to eliminate the necessity of exerting pressure during the valve grinding operation. It is finished in black enamel and retails for 20 cents. This tool, as are all other Apco products, is sold with an unqualified guarantee.

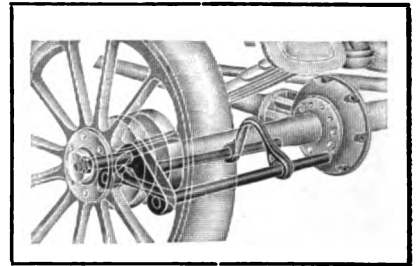


Apco Valve Grinding Tool.

CARPENTER TOWING DEVICE.

Emergency Device Which Will Allow the Ford Car to Be Towed on Its Own Wheels Regardless of Speed.

The Post & Lester Co., 112 Allyn street, Hartford, Conn., is marketing the Carpenter towing device for Ford cars, shown in the accompanying illustration. This



Carpenter Towing Device Assembled on a Ford Car.

is an emergency device which will allow the car to be towed to the repair shop even if the axle is broken. The broken end of the axle is forced out of the hub and the wheel mounted on the axle of the towing device, which supports the brake drum of the car and is held rigid by a yoke that straddles the axle housing. It is made secure by a hook over the radius rod. The manufacturer declares that a Ford car can thus be moved on its own wheels over any road for any distance and at any rate of speed. The device retails at \$7.50. Garages and repair shops will do well to investigate this device. Inquiries addressed to the company will receive prompt attention when this journal is mentioned.

SPARK PLUG DISPLAY CASE.

Spark Plug Manufacturer Supplies Dealer Who Orders Stock with Case in Which to Show the Plugs.

A handsome spark plug case which contains a complete stock of Bethlehem plugs and equipment for displaying the various types at the front is supplied by the Silvox Company, 171 Madison avenue, New York, to dealers who buy a stock of plugs. The cabinet is 15 inches high, 10 inches long and eight wide. It is made of wood, metal bound, and is neat in appearance. On the inside of the rear door are attached cards, giving information as to plug sizes used on various cars. The display plugs are mounted behind glass. Capacity of the case is 48 Bethlehem

plugs and six extra porcelains. The plugs are guaranteed for the life of the car in which they are used. A supply of literature and display matter regarding Bethlehem plugs is packed with each case. The number of cases to be distributed is limited. Prices can be obtained by inquirers who mention this publication.



Bethlehem Spark Plug Display Case.

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INDUSTRIAL HAPPENINGS AND COMMENT.

THE Federal Rubber Manufacturing Company's plant at Cudahy, Wis., is to have a five-story addition, which will provide 50,000 square feet of floor space. The majority of the addition will be devoted to processes in connection with building automobile casings. Although pneumatic tire manufacture engages the larger part of the company's activities, an extensive line of rubber goods, such as mats for automobiles, rubber heels, horse shoe pads and baby car tires are also made.

The Oakes Company, Indianapolis, Ind., has increased its capitalization from \$50,000 to \$75,000 to take care of increased business and the addition of several specialties to its line of products. The company is the maker of the Beartone horn, the fan horn pump, license brackets, etc. The officers of the company remain as before.

The Northwestern Chemical Company, Marietta, O., is distributing its "Auto Suggestions," a miniature magazine that contains information and suggestions of much value to motorists and garage proprietors. It is free upon request.

The Marathon Tire and Rubber Company, Cuyahoga Falls, O., announces the appointment of C. M. Folger as southeastern representative of the company, with headquarters at Atlanta, Ga.

The Burd High Compression Ring Company, Rockford, Ill., announces the appointment of O. P. Hand as director of publicity. Mr. Hand has had 14 years experience in a similar capacity with the Minneapolis Iron Store Company and an extended connection as editor of a prominent trade paper.

The Velle Motor Vehicle Company, Moline, Ill., in addition to an announcement of a relocation of several factory departments, to increase production efficiency, declares a change of policy in distribution of its product as concerns the John Deere branches. Hereafter distribution in Minneapolis, Omaha, Kansas City, Denver, Oklahoma City and other cities where John Deere branches were formerly used will be handled by automobile distributors. The change is declared not to represent a change in the cordial relations between the Velle company and the John Deere factory interests.

Apperson Bros. Automobile Company, Kokomo, Ind., has started work on an addition to one of its plants, which will give 150,000 square feet of floor space. The whole plant is being keyed up for the 1916 season. One of the methods is to post placards in conspicuous parts of the plant bearing the following Apperson creed: "Remember, men! You have the future of this company in your hands. The work you do—each operation, each task, each item—reflects on this factory and its future. And so, if you will do each task given the best you know how to do it, you will take genuine pleasure in your work, bring personal satisfaction to yourself and credit to this company. Do each thing as if you were doing it for yourself!"

The Hupp Motor Car Company's second vice president, Charles Denby, who formerly was United States consul-general to Austria-Hungary at Vienna, has returned from a trip to the Orient. He visited Hawaii, the Philippines, Japan, China and Korea. It was Mr. Denby's first visit to China in six years and the first within 18 years to Peking. He is a personal friend of the present Chinese president, Yuan-Shih-kai. Mr. Denby has made some very interesting observations of the Chinese republic of today.

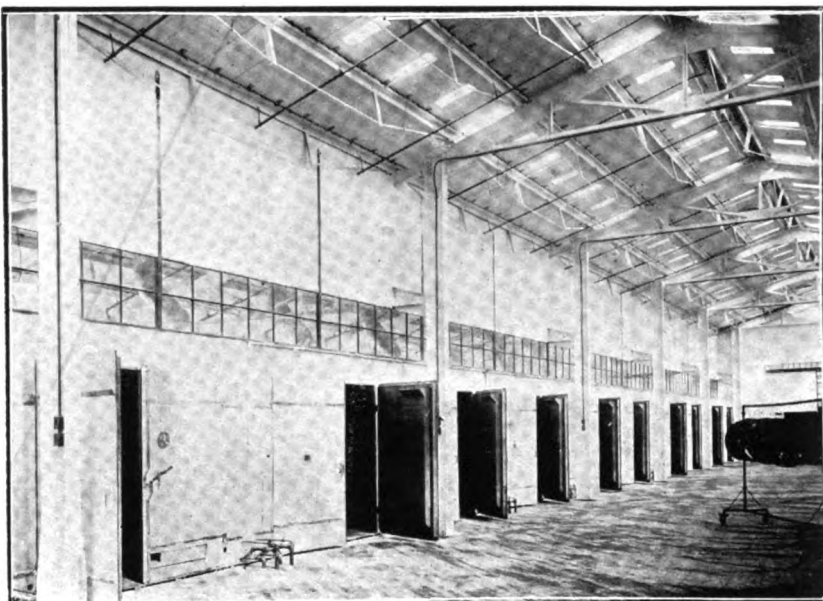
The Metz Company, Waltham, Mass., resumed operations Aug. 16 after a week's shut down for the employees' annual vacation.

The Willys-Overland Company, Toledo, O., has issued a new catalogue showing with text and elaborate de-

tailed illustrations the merits of the new Willys-Knight model 84 car. It is an exceptional piece of literature and will prove interesting to all readers.

The Continental Motor Manufacturing Company, Detroit, Mich., has installed a new belt test. It precedes the block test and eliminates possibility of injury to bearings, etc., in that operation. The belt test endures for four hours, normally, during which the bearings and wearing surfaces are broken in and thorough lubrication effected. The block test lasts for eight hours, the motors running under their own power. Two tests are given every engine turned out.

The Studebaker Corporation has installed in its No. 3 plant at Detroit 23 enamel baking ovens, equipped with a pyrometer system. Each oven is represented by a light box, which contains three lights. A red light shows the temperature in the ovens is too high; a green light that it is too low, and a white light that "all's well." The system is not only labor saving in reducing the number of oven tenders required, but insures accuracy of results.



Studebaker's New Enamel Baking Equipment, Consisting of 23 Ovens, Controlled by Pyrometer System.

The air in the oven enclosure is water washed to keep out dust particles.

The Hartford Machine Screw Company, manufacturer of Master spark plugs and Master garage tire pumps, in addition to its other products, announces that two large and imposing additions to the plant at Hartford, Conn., are nearing completion. The buildings include a six-story structure, 206 by 46 feet, and another of two stories. Combined the two provide floor space in excess of 80,000 square feet. New machinery is being installed. The new buildings are expected to be ready for occupancy by Sept. 1.

The Grant Motor Company, Findlay, O., has brought out a six-cylinder car known as the model TT. It is not a 1916 model, but rather a 1915 summer series model. The only difference between the TT and the T model is that the former has a motor of three-inch bore, while the latter has 2 1/2-inch bore. In the model T a Mayer carburetor was used, but the TT has a Rayfield. In other constructional or equipment features the two cars are alike and the price also is the same.

The Republic Motor Truck Company, Alma, Mich., of which F. W. Ruggles is general manager, reports that during the fiscal year the company's truck sales increased over 800 per cent., 95 per cent. of the total output of the factory being consumed in the United States.

ROAD CONGRESS PROGRAMME.

In the Pan-American Road congress, which is to be held at Oakland, Cal., Sept. 13, road officials of the New England states are to have a large part. Many important papers will be presented by them.

Governor Charles W. Gates of Vermont is chairman of the executive committee and J. H. MacDonald of Connecticut, another member of the committee, will preside at one of the general sessions. Colonel William D. Sohier of Massachusetts will likewise preside for one day.

Paul D. Sargent, chief engineer of the Maine highway department, will lead the discussion on "Proper Road Location," and Chief Engineer A. W. Dean of the Massachusetts commission will present a paper on "Maintenance, Materials and Methods."

The official programme of the meeting shows that 27 different subjects will be discussed during the 10 sessions, covering practically every phase of road and street building, repair, cleaning and administration.

Papers on various subjects will be presented by an authority on the type of work under discussion. The meeting then will take up the discussion and every detail of the approved practises is to be made clear to the delegates.

Most of the sessions will be held in the municipal auditorium in Oakland. Wednesday, Sept. 15, will be Road Congress Day at the exposition and that day's sessions will be held on the exposition grounds. Arrangements have been made to run a special train for the delegates, leaving Chicago, Sept. 2, and visiting many points in the West before it arrives on the Coast. Returning this train will leave San Francisco Sept. 19 and will arrive at Chicago, Oct. 2.

SCRIPPS-BOOTH CARS IN EUROPE.

Scripps-Booth cars are much in demand among the European aristocracy. Peters & Sons, London, have ordered a large number, which are going forward at the rate of 10 cars a day.

Discussing this demand for an American light car of distinctive high quality, an Englishman is said to have remarked recently to a Scripps-Booth representative:

"There has been a great deal of fun in your newspapers concerning Europeans who come to America for wives, the sting lying in the suggestion that they are most interested in the dot that

goes with the girl. There is a lot of rot about that. American girls represent something—the power and freshness of the new world galvanized into beauty and style. Just because the makers of the Scripps-Booth have been able to put into their product this same quality we in Europe want the car."

FEDERAL TIRE MILEAGE RECORDS.

In the sharply contrasting conditions experienced by a city taxi-cab and a car on the rough country roads surrounding lumber camps, Federal tires have recently made excellent records that have been reported to Sales Manager Henry Githens.

On one of the cabs of the Central City Taxi Car Company, two 34 by four Federal tires, with rugged treads, have been driven 9000 miles over all sorts of streets in and about the city. C. H. Akers, mayor of Monte Vista, Col., who owns a number of lumber camps, declares that he has had 11,000 miles service from a set of tires on his car, which was run over the worst of forest and mountain roads. Thomas C. Raymond of Cambridge, Mass., got an average of 6617 miles from each of 10 Federal tires. G. S. Mann, a rural mail carrier of Tyrone, Okla., has obtained 21,000 miles from two motorcycle tires.

NEW LOGS OF CHATTANOOGA ROADS.

The Chattanooga Automobile club, which was largely instrumental in organizing the Dixie highway, has taken up the logging and improvement of the roads about its own city. The new road data is being brought up to date by path-finding cars and the logs are printed in a convenient form for distribution to motorists. The publicity given the Dixie highway has brought an unprecedented number of inquiries concerning the condition of the roads in that part of the country. The road from Nashville to Chattanooga is in bad shape, but is being travelled. Roads to Atlanta, Knoxville, Birmingham and Memphis are in good condition and are much used. As soon as the work on the Dixie highway is fairly well advanced the traffic through the country will, from present indications, be very large.

Oil in time keeps the automobile fine.

MUCH MORE ALUMINUM IS USED.

Since the successful adoption of aluminum pistons by several manufacturers, signs have multiplied that in the growing concentration upon the problem of reducing weight in motor cars, much more of that metal is to be employed in the future.

It is said that several automobile engineers have tried out aluminum cylinder castings in their cars. A number of cars are reputed to have been sent out by well known makers with aluminum cylinders, which had been painted over so that the purchasers did not recognize the material. Further, it is stated, that these cylinders have given perfect satisfaction. Several engineers plan to use aluminum cylinders as standard next year.

The entire casting, including the upper half of the crank case, is aluminum, with the exception of a very thin sheet of steel against which the piston runs, and of steel plates embedded in the valve seats. This reduces weight very materially, and as aluminum is a much better conductor of heat than is cast iron, the cooling efficiency of the motor is greatly improved. The castings cost slightly more than iron at present, but on large scale production that difference could be largely eradicated.

Practically all brass used in grease cups, intake manifold and in all parts but bearings and bushings is likely in the not distant future to be replaced by aluminum. These changes are expected by many engineers to reduce the car weight by fully 25 per cent. without decreasing their efficiency and so save a great deal of expense in tires and gasoline.

SUN LIGHT SIX FEATURES.

"General description of the new Sun light six, which is to be produced in Buffalo by the Sun Motor Car Company, has been made public. The motor is an L head type with cylinders three by five inches. It is a high speed, high compression type, and is guaranteed to develop 50 horsepower on a block test. The intake manifold and hot air connection are cast integral with the cylinder casting. Reciprocating parts are very light, so that the engine can operate at high speed without undue vibration.

The transmission is mounted as a unit with the motor. A three-plate dry disc clutch is used. The cars will be finished in brewster green, with black running gear and fenders. R. Crawford,

formerly general sales and advertising manager of the Haynes Automobile Company, Kokomo, Ind., is vice president and general manager of the Sun Motor Car Company, while R. C. Hoffman, recently a Haynes designer, is chief engineer and production manager. Three of the first test cars will start on a transcontinental tour at an early date and will visit all of the principal cities in the United States.

NEW ALCOHOL MOTOR FUEL.

A new motor fuel distilled from waste molasses at sugar factories in Durban, Natal, has been tested out by the Royal Automobile Club in London and has been found to work very satisfactorily in the ordinary gasoline engine.

The fuel consists of alcohol and ether, the latter being a derivative of the former. The whole fuel is capable, therefore, of being manufactured in an alcohol distillery from crops that can be grown in any desired quantity.

In careful comparative tests of the new fuel with gasoline of .71 specific gravity, it was found to yield a slightly lower mileage per gallon, but this would be of no significance if the price at which it could be sold were lower than for gasoline.

It is used in the ordinary gasoline engine, and with the usual carburetor, the only adjustment necessary being that less air be admitted in carburetion. It is said that this fuel does not carbonize the motor and that it will even remove carbon from foul cylinders. There is no difficulty in starting a cold or warm motor using it.

In Europe, where the price of gasoline is high, and in many tropical countries where alcohol can be made cheaply, this fuel may have great possibilities. The company that discovered it says that production as at present conducted costs about 12 cents a gallon, but if produced in large quantities and unaffected by excise restrictions on alcohol it could be sold in many parts of the world much cheaper than is gasoline at present.

This in turn would increase the supply of gasoline available in other centres and would have the result, probably, of keeping down fuel costs for motor cars all over the world.

If found necessary to drive an automobile in the rain, a coat of petrolatum covering the bright parts will shed the water and make it unnecessary to polish immediately. The grease can be readily removed.

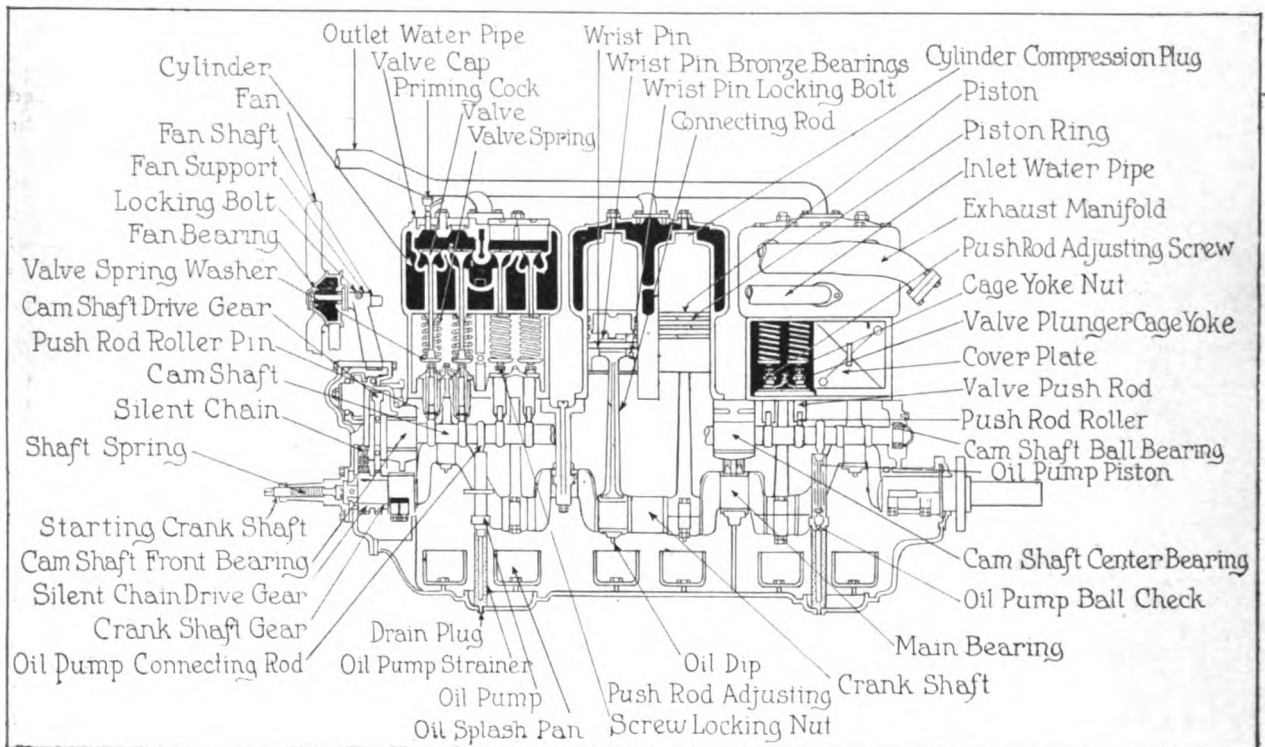
PRACTICAL FACTS FOR NEW CAR OWNERS.

Where the Causes for Motor Troubles Usually Are To Be Found in the Average Engine—Queries—Practical Suggestions.

THE ease and speed with which some automobile operators can locate and remedy motor troubles often astonishes the new car owner and creates a feeling of envy, especially on a hot and dusty road. While it is not probable that the novice can immediately attain the facility of a professional repairman, it is possible, however, for him to acquire knowledge that will largely minimize labor and discouragement. There are certain arbitrary rules for the location

When the engine suddenly goes "dead" on the road, search for broken spark plug; interrupted gasoline supply; disconnected electric circuit; broken wires; a stuck spark coil trembler; loose terminals, and examine the timer thoroughly for trouble.

There are several causes for inability to start an engine. The gears may be broken or jammed; the mixture may be weak, or there may be moisture in the gasoline, or the supply may be cut off



Sectional View of a Six-Cylinder Motor, Showing the Different Components That May Give Trouble.

of trouble that the new owner should familiarize himself with and always bear in mind.

When the engine is operating in fits and starts the operator should look for: Broken insulation on wiring; improper adjustment of the carburetor, which makes for a poor fuel mixture; cracked spark plug; defective connections; partial stoppage of gasoline feed; water in the oil case, or moisture on ignition plugs; poor timing contact; inaccurate adjustment of the spark coil; damaged or loose terminals on the coil.

entirely; the cylinders may be dry, or there may be water present, which is probably due to a cracked water jacket; battery plug may be out of position, or the battery switch open; compression may be weak; spark plugs cracked or in need of cleaning; the inlet valve may be stuck.

A hissing sound coming from the motor indicates trouble. There may be a compression tap open; a spark plug may be broken; the exhaust pipe cracked; or the exhaust pipe and silencer loosely joined.



Attractiveness

is only permanent when beauty is combined with worth, and where possession is in itself a value. Surpassed by no other motor car in outward attractiveness, Scripps-Booth luxurious light motor cars have acquired in a single season a reputation of worth and value which makes the outward beauty and social value of this

Scripps-Booth

design far subservient to the wonder of easy riding and road performance which this car has shown. The greatest proof of Scripps-Booth quality and worth is shown in the standing of those now driving these cars; persons of prestige and business acumen; the most critical and exacting of all purchasers.

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Two common causes of the crank case becoming overheated are that the piston head is cracked, or the piston rings may be so broken or worn as to cause a leak of burned gas.

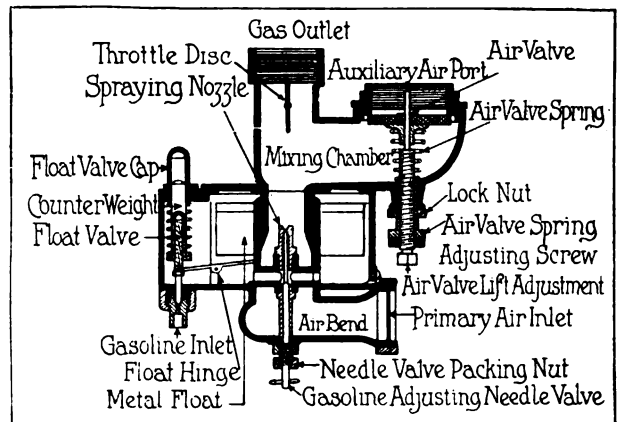
Examine the carburetor when the car gradually loses traction and the motor misfires simultaneously. It may be fouled at the jet. See that the gasoline valve is not shut off, and that there is no excess of carbon on spark plugs from either poor or over lubrication.

Like the weak respirations of a human being, the weakened explosion of a motor indicate "poor health." See that there is sufficient lubrication, that the gas mixture is adequate, the muffler outlet is not stopped up by carbonized oil or mud, the carburetor compensating valve is in order, the inlet valve plug is not weak, the coil vibrator is correctly adjusted, the platinum contacts are clean, loose valves or plugs do not cause poor compression, the lift on the exhaust valve is not reduced.

Engine knocks are not always due to worn or loose bearings, though they should be looked for of course. They may occur because the mixture is too rich, the lubrication is poor, or excess carbon deposits cause preignition. If found that

none of these are the cause, the cylinder on the crank case may be loose, nuts may be wearing off, the flywheel may be loose on the shaft, or the operator may have the spark advanced too far.

Five troubles are generally the cause for ex-




The Members of a Standard Type of Automatic Float Feed Carburetor and Their Relation for Normal Service.

plosions in the mufflers: Gas mixture is too weak, spark is over-retarded or inefficient, exhaust valve is stuck or does not seat properly, cylinder misses fire and allows explosive charges

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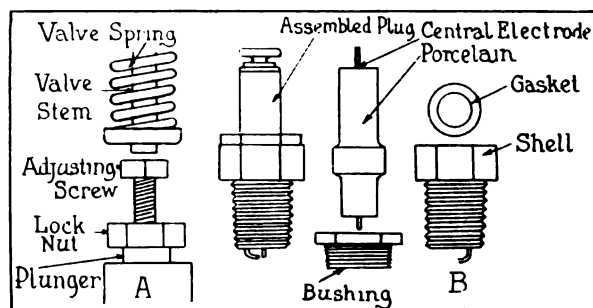
to enter the muffler to ignite when next charge is exhausted.

The use of the low gear for too long a period, a throttled exhaust, a clogged muffler, a retarded spark usually results in an overheated exhaust pipe; i. e., either one of these or all may be the cause.

Boiling water in the radiator indicates either the spark too far retarded; incorrectly timed valves; a defective pump; clogged radiator tubes, or clogged muffler; poor circulation of water; fan not working; throttled exhaust. It is possible that the low gear has been used for too long a continuous period.

When explosions take place in the carburetor or inlet pipe, examine the gas mixture, see that the valves are timed properly, that the inlet valve spring is not defective, that the valves do not leak, that the inlet valves seat properly, or that the spark is not over-retarded.

If examination absolves the motor from sus-



A, the Usual Method of Adjustment of Engine Valves and Tappets; B, the Parts of a Standard Type of Spark Plug Disassembled.

picion when the car runs slowly, turn to the brakes and the clutch. The brakes may not release easily. The clutch may have slipped, the clutch leathers may be worn or dry, or the clutch springs may be weak.

Brakes may be the cause of squeaking, and if so see that they are properly lubricated at the friction points. Or the squeak may be due to the fact that the brakes do not release completely.

READERS' QUERIES.

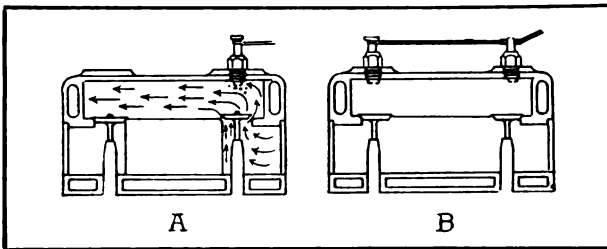
**Suggestions to Owners on Benefits
from Use of Two Spark Plugs, the
Timing of a Four-Cylinder Motor,
and a Table of Correct Air Pressure.**

Use of Two Spark Plugs—W. H. S., Fairhaven, Conn.

I have a six-cylinder chassis which I have equipped with a racy type body. Do you believe that greater

power can be developed by the use of two spark plugs in each cylinder?

The motor power will be greatly increased by fitting each cylinder with two spark plugs which will fire simultaneously. The efficiency of this equipment was demonstrated in the recent 500-mile sweepstake at Indianapolis, in which 17 of the starters were fitted with two-plug ignition systems. The principle of the gasoline engine is that the explosion shall take place when the piston is at top centre and instantaneous and complete. It will be seen by reference to the accompanying illustration A, that when one plug is used, the ignition starts at one point and the rapidity of combustion depends on the condition of the gas. While this may seemingly be of minor importance, when the engine is running at great speed, each explosion should have its maximum efficiency, which can only obtain by the quickest possible consumption of fuel. By referring to the illustration B, it is obvious that when combustion is started at two widely sep-



A, Showing Comparatively Slower Combustion with Single Spark Plug; B, Two-Plug Ignition Tends to Perfect Combustion.

arated points, the combustion of the explosion is much faster and more efficient. An advantage of double ignition is that should one plug become sooted the other plug will continue to fire, and this may burn the soot, clearing the plug. Greater reliability can be obtained by the use of the two-plug system.

Timing a Four-Cylinder Motor—B. V. G., Mt. Vernon, N. Y.

Can you explain or illustrate the timing of a four-cylinder motor? The car is an early type and neither the flywheel nor gears are marked.

As all motors are not timed alike, it is impossible for the writer to state the exact timing, but from the following you will probably obtain the required information. The crankshaft crankpins of a four-cylinder motor are usually set at 180 degrees, or one-half revolution apart. It is obvious then that the crankshaft must complete two full revolutions before all four cylinders are fired. The general firing order of this type of motor is one, three, four, two. The valves must open and close in accordance with the firing order. The

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valves are operated by the camshaft, which is driven by a gear from the crankshaft. You do not state whether the motor is a T or L head, but taking it for granted that it is an L head and that the valves are operated by a single shaft, the cams are so placed on the shaft that all are opened and closed during one revolution. To drive the camshaft half the speed of the crankshaft, the gear on the camshaft must contain twice as many teeth as the gear on the crankshaft. In modern engines the cams are cut integral with the camshaft and there can be no variance of these except from long wear. The cams of some earlier motors are keyed on separately. I suggest, if the cams are keyed, that you determine whether the keys are worn, for timing with worn cams

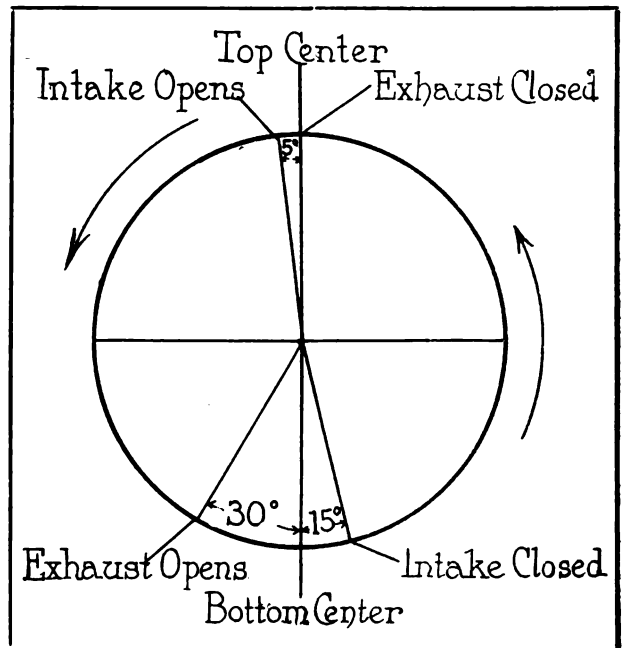


Diagram Showing Approximate Time of Opening and Closing of the Intake and the Exhaust Valves.

and loose keys is almost impossible. If the cams are true the first operation is to find the dead centre points of the flywheel, the top and lower centres being diametrically opposite. The dead centre is obtained when the pistons of the first and fourth or second and third cylinders are at their highest point of travel. When this point is determined, the flywheel should be permanently marked. The timing of the valves is now a simple matter, depending, of course, on the design. If it is a large engine and not a high-speed type, the approximate timing is similar to that shown in the accompanying diagram, although nothing but actual trial will determine the best valve setting for any engine. It will be noted that the

intake valve starts to open at five degrees past top centre and closes at 15 degrees after bottom centre. The arrows at the outside of the circle indicate the direction of the flywheel and the two strokes completed in this instance are the intake and compression. The next half revolution of the flywheel will be the power stroke, during which all valves remain closed. The fourth stroke is the exhaust, the exhaust valve starting to open about 30 degrees before bottom centre and closing at top centre. It will be well to remember that much of the timing on earlier models is accomplished by lengthening the pushrod so as to engage the valve earlier and close it later, or by shortening it the valve is opened later and closed earlier.

Valve timing is usually tedious work, as frequently the mesh of the cam and crankshaft gears must be changed several times before the correct relationship is found. When positive that the gears are properly set, it is good practise to mark a corresponding tooth of both gears with a centre punch, so that the same relationship may be obtained at any future period should it be necessary to again disassemble the parts.

Correct Air Pressure—G. K. R., Harvey, Ill.

Can you give me any information as to the correct pressure required in different sizes of tires? Does the weight of the car establish the tire pressure?

The weight of the car is the real factor for determining inflation pressure for tires. A gauge is sold that indicates pressures required for varying loads on vehicle wheels. The following table, prepared by a well known tire manufacturer, indicates the pressure for different sizes of tires and the maximum weight that should be carried:

Size, Inches.	Weight Per Wheel Pounds	Air Pressure Pounds
28 to 36x2½	225	40
28 to 36x3	350	50
28x3½	400	60
30x3½	450	60
32x3½	550	60
34 and 36x3½	600	60
30x4	550	75
32x4	650	75
34x4	700	75
36x4	750	75
32x4½	700	85
34x4½	900	85
36x4½	1000	85
36x5		90

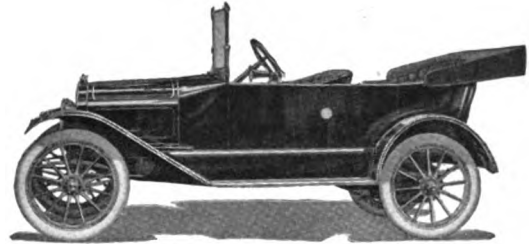
REPAIR OF A CRACKED MANIFOLD.

Chewing gum and a handkerchief are sufficient in some cases for an effective temporary repair to a cracked manifold. Such accidents are of frequent occurrence on some two-cylinder motors that have brass intake manifolds. The break is hard to locate usually, but can be detected by

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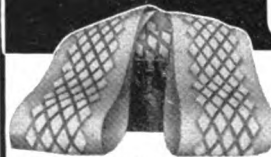
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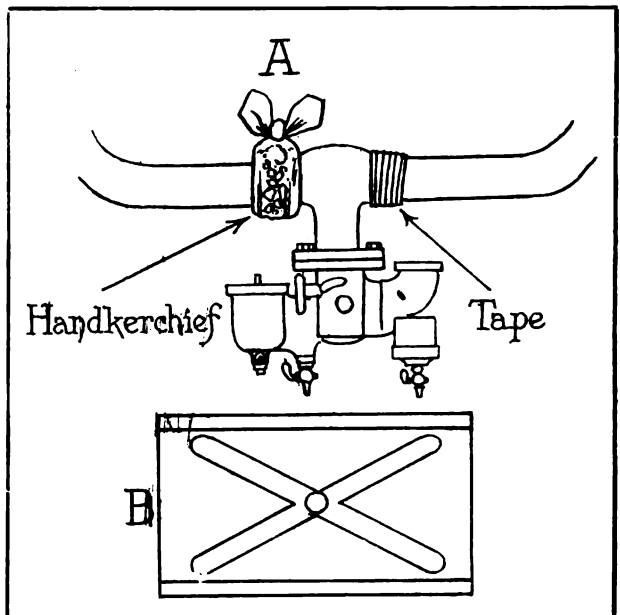
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applying kerosene oil around the joint, which will be sucked in at the point of break and thus indicates its location. If electric tape is not at hand, a well masticated piece of chewing gum can be applied to the break and held in place by a tightly bound handkerchief, as shown at A in the illustration. A repair made with tape is shown at B.

OIL GROOVES.

Plain bearings are made of babbitt, brass, bronze, and in rare instances, of cast iron. They are to be found in great numbers in the earlier types of cars, although they have been replaced in most of the later models by roller and ball bearings. Plain bearings are exceptionally difficult to keep well lubricated, unless the proper types of grooves are cut. The diagram illustrates grooves that will insure ample lubrication. A



A, Emergency Repair of a Cracked Manifold; B, Illustrating How Oil Grooves Should Be Cut to Insure Better Lubrication of Plain Bearings.

small hole is drilled through the centre of the split bearing and small grooves should be cut into the surface of the metal with a small draw chisel. The grooves should lead to the different corners, but should not break through. The burred edges can be smoothed with a round file.

INSERTING SPARK PLUGS.

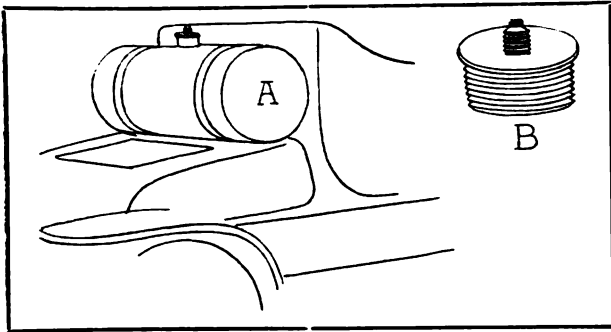
Metal will expand to a certain extent when subjected to heat. Frequently the removal of spark plugs is extremely difficult, and the cause

was that the cold plug was tightly screwed into a hot cylinder. When the plug and cylinder become hot, both expand equally, causing an extremely tight fit. One should fairly seat the cold plug in the hot cylinder, and when the plug is hot it may be securely tightened. Or the plug may be seated fully when the cylinder is cold.

FORCING FUEL FROM GRAVITY TANKS.

On many types of gravity tanks, especially the earlier models, trouble is experienced in feeding the last few gallons of gasoline to the carburetor. Often it is impossible to supply enough fuel to climb even the slightest grades. A simple and effective remedy for this is illustrated.

Obtain an old tire valve stem and cut off the bottom section. A small hole can now be drilled in the tank filler cap and the stem soldered in place as shown at B. When the tank contains a large quantity of gasoline the check valve



A, Usual Location of the Gravity Fuel Tank on Runabouts; B, Showing Assembly of Emergency Air Vent and Filler Cap.

can be removed from the stem, thus affording a gravity feed. Should the gasoline become low, however, so as to cause an uneven flow to the carburetor, the check valve can be inserted and air forced into the tank by a hand pump. This will expel all the fuel. It may be advisable to cut a rubber gasket to fit around the cap so as to insure air tightness.

SCRATCHED CYLINDERS.

While the better practise in the case of a scratched cylinder is to have it and the other cylinders rebored, a temporary repair can be made by filling the scratch with flake graphite. It is essential at the same time to mix a small quantity of the graphite in the lubricant, which will have the effect of forming a film over the cylinder surface and will reduce the friction between the piston and the cylinder wall.

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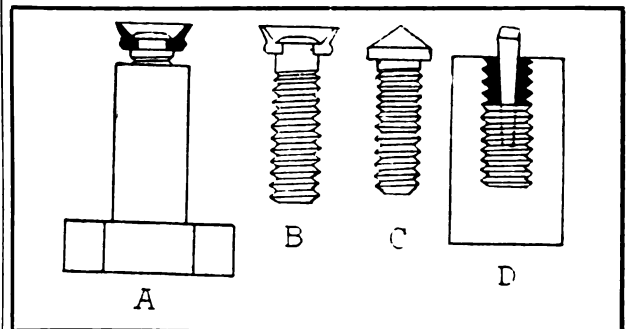

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PREVENTING RIMS FROM RUSTING.

When a tire has been attached to a rim for any length of time its removal is often difficult, because of rust. This rust can be expected with practically all rims, but it can be prevented by the use of quick drying shellac varnish in which flake graphite is mixed until a paste is formed. This should be applied to the rim, in thin coats, after the metal has been thoroughly cleaned by filing and by the use of emery cloth.

BROKEN SCREWS AND BOLTS.

The removal of broken screws and bolts is sometimes difficult work. A common method employed is the striking of a small chisel at the edges of the broken part. While this operation may be successful, it is not advised, as the threads of the hole may be damaged. A better and more workmanlike way is to drill a small hole in the



A, B and C, Forms of Small Jacks for General Use; D, Suggestion for Removing Broken Bolts and Studs from Holes.

stub and then drive a tapered four-sided punch into it, as shown in D. The punch head can then be gripped with a small wrench and the punch and the broken screw removed as a unit.

HOME MADE SMALL JACKS.

Small jacks are very useful equipment for any repair shop or garage. A jack similar to that shown at A can be easily made in the following manner: Obtain a fairly large size bolt having a hexagon head. Cut off the threaded end and file the surface flat, and drill and tap a hole through its centre for the entire length. The screw can be a part of an old clamp having a swivel head, as shown in B, or it can be made from a smaller bolt, the head being filed to a point, as shown in C. For convenience of turning, small holes may be drilled through the top of the screw to receive a small rod.

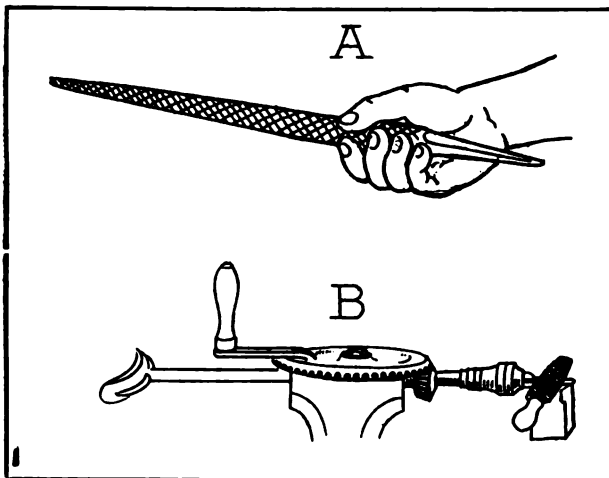
HOLDING A FILE WITHOUT A HANDLE.

It is always the safer policy to use a handle on the tang of a file, but should none be at hand, the file can be safely handled, as shown herewith.

The tang end should not be held in the hand, but the file grasped a little higher up. When the hand is held above the file it is impossible for the tang to touch the flesh. This suggestion will be especially helpful when filing on a lathe, because, should the file become caught in the work, the workman cannot be injured.

FILING A TAPER PIN.

Few inexperienced persons can accurately file a taper pin in a vise with satisfactory results. A method insuring accuracy and satisfaction is il-



A, Proper Way to Hold File; B, Filing a Taper Pin.

lustrated herewith. Grip an ordinary hand, or breast drill firmly in a vise and place the piece of steel in a chuck, and if desired place a notched piece of wood under the pin, as illustrated. Rotate the drill with the left hand, while filing the pin with the right. With a little care, one may make a pin as well fitting as can be turned in a lathe.

Poor lubricating oil will cause excessive carbon deposits on combustion chamber walls, piston heads and on points of spark plugs. Carbonized spark plugs may form a short circuit, interfering with ignition. Excessive deposits will hold enough heat between explosions to cause preignition.

Throw out clutch at corners and sharp turns. This will minimize skidding and consequent wear upon tires.

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Truck Operation \$1.00

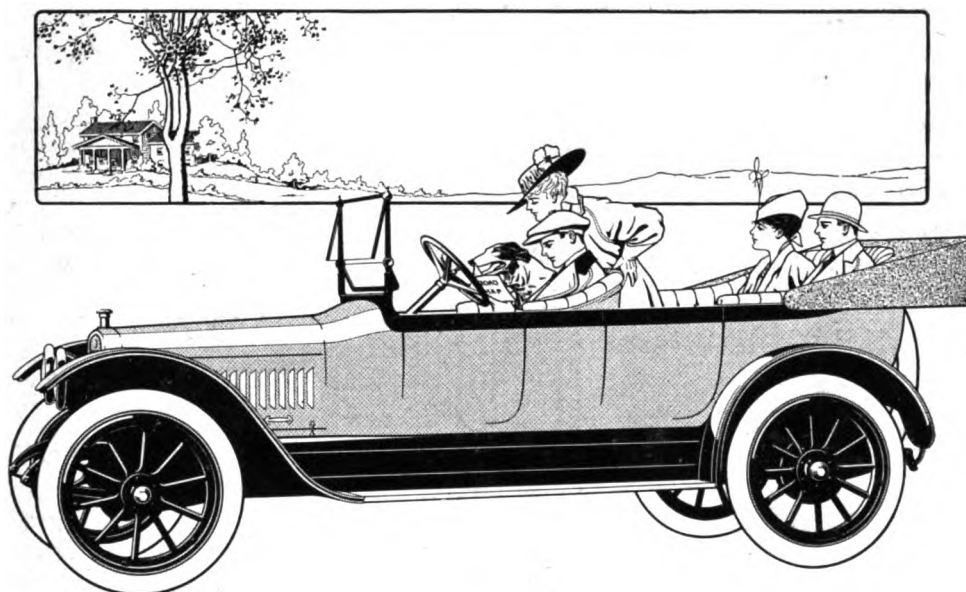
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Pawtucket, R. I.

WINTON SIX

NOTICE



¶ Last winter we announced the 33 H. P. New-Size Winton Six at \$2285. Deliveries began this spring. We are now manufacturing this extremely successful model, and shall continue its manufacture until next year without change.

¶ Shortly before the next New York show we shall announce a new model of the 48 H. P. Winton Six, which now sells at \$3250. There will positively be no reduction in the price of this car.

¶ From its exhaustive experience with motors of various types, the Winton Company is convinced that the world has not produced a motor superior to the rightly-built six-cylinder; hence, we shall continue to make sixes exclusively.

¶ Having for years enjoyed the confidence of the best class of motor car buyers, our patrons may be assured that we have no intention whatever of offering for sale any experimental model. And they may be equally certain that we will not cheapen the character of our product. In other words, if you buy a Winton Six today, you will not find the Winton Company discrediting your purchase and destroying your faith in us, tomorrow, or next week, or next month, or next year.

The Winton Company

131 Berea Road, Cleveland, Ohio, U. S. A.

The New
REO
the Fifth
The Incomparable Four



SPECIFICATIONS

The New Reo the Fifth—\$875

Wheel Base—115 inches.
 Springs—Front—Semi-elliptic—38" x 2" with 7 leaves. Rear—three-quarter elliptic. Lower section—44½" x 2" with 7 leaves; upper section 22 13-16" x 2" with 7 leaves.
 Front Axle—I-beam, drop forged; with Timken roller bearing spindles.
 Rear Axle—Tubular—semi-floating, Timken roller bearings at differential—Hyatt High Duty roller bearings at wheels, pinion integral with stud shaft—two universal joints in propeller shaft.
 Tires—34" x 4" front and rear. Non-skid on rear.
 Motor—Vertical, four-cylinder, cast in pairs, modified L type with integral head, with inlet valve in head. Valves mechanically operated and protected.
 Cylinder Dimensions—4½" x 4½".
 Horsepower—35.
 Cooling System—Water jackets and tubular radiator, cellular pattern.
 Lubrication—Automatic force feed by plunger pump with return system.
 Carburetor—Automatic, heated by hot air and hot water.
 Ignition—Combined generator and magneto, driven through timing gears with 100 ampere hour storage battery.
 Starter—Electric, separate unit, six volt, connected to transmission.
 Transmission—Selective swinging type with single rod center control.
 Clutch—Multiple dry disc, faced with asbestos with positive and instant release.
 Brakes—Two on each rear wheel, one internal, one external, 14" diameter drums—service brake interconnected with clutch pedal.
 Steering—Gear and sector with 18" steering wheel.
 Control—Left-hand drive, center control—spark and throttle on steering wheel with foot accelerator.
 Positive—Thief-proof locking device.
 Fenders—Drawn sheet steel of latest oval type—shield between running boards and body—close fitting, quick detachable under pan—aluminum bound, linoleum covered running boards.
 Gasoline Capacity—16 gallons.
 Body—Five-passenger—streamline touring type with extra wide full "U" doors, front and rear. Genuine leather upholstery. Deep cushions and backs.
 Finish—Body, Golden Olive, running gear, black; equipment nickel trimmed.
 Equipment—Fully electric lighted throughout; improved 5-bow, one-man mohair top with full side curtains; mohair slip cover; clear-vision, rain-vision, ventilating windshield; speedometer; electric horn; extra rim with improved tire brackets; pump; jack; complete tool and tire outfit; foot and robe rails.
 Price—\$875, f. o. b. Lansing, Mich.

Here Are the New Reo Models

Look at the cars, study the specifications and wonder!

Knowing values as you do; knowing the Reo policy as you do; knowing the Reo standards as you do; and adding to that Reo integrity which you also know guarantees "quality in unseen places", you will marvel at these values.

For you know, that Reo would never reduce the quality of Reo cars to meet a price competition.

You know how price reductions of some cars have been arrived at this year—that's no mystery to men in the trade.

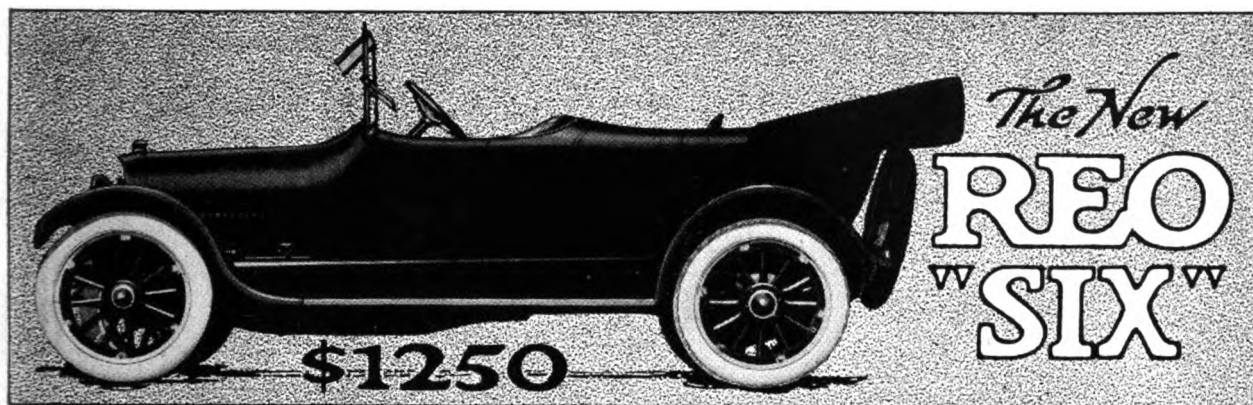
And you know Reo would not—and a close study of these two models will prove that Reo has not—done that.

You'll want to know how it was accomplished. You'll want to know how these prices for this quality-product were made possible.

Then read the big two page Reo announcement that will appear in the leading newspapers next Sunday, September 12th, also in leading national weeklies—Colliers, Leslie's, Literary Digest and

Reo Motor Car Co.,

(When Writing to Advertisers, Please Mention The Automobile Journal.)



And the New Reo Prices

Christian Herald—and in Agricultural and Automobile Trade press throughout America.

Read it—it's the latest and most interesting news of this industry.

If you happen to be located in one of the few places where Reo is not at present represented; if you want to hitch your wagon to a star; if you want to handle the kind of automobiles that do not need pushing; if above all, you want to sell the kind of cars that stay sold—that cost the dealer less to make good his guarantee than any others:

If in a word, you not only want volume of business, but satisfactory business; and not merely gross profit but net profit, at the end of the year, you had better get in touch with our sales department quickly.

You know the demand for Reos during the past year has been vastly in excess of the possible output of the factory. When you see these new Reos and these prices you will realize that the demand is going to be still greater. Get on the Reo bandwagon—once on you will stay on if you are the right kind of dealer to represent Reos.

Lansing, Mich., U. S. A.

SPECIFICATIONS

The New Reo Six—\$1250

Wheel Base—126 inches.
Springs—Front—Semi-elliptic—38" x 2" with 8 leaves. **Rear**—Cantilever—50½" x 2¼" with 8 leaves.
Front Axle—I-beam, drop forged with Timken roller bearing spindles.
Rear Axle—Full floating. Timken roller bearings at differential and at wheels—two universal joints in propeller shaft.
Tires—34" x 4½" front and rear. Non-skid on rear.
Motor—Vertical, six-cylinder, cast in threes, modified L type with integral head, with inlet valve in head. Valve mechanically operated and protected.
Cylinder Dimensions—3½ x 5½"
Horsepower—45.
Cooling System—Water jackets and tubular radiator, cellular pattern. Water circulation by centrifugal pump direct to exhaust valves.
Lubrication—Automatic force feed by plunger pump with return system.
Carburetor—Automatic, heated by hot air and hot water.
Ignition—Combined generator and magneto, driven through timing gears with 100 ampere hour storage battery.
Starter—Electric, separate unit, connected to transmission.
Transmission—Selective swinging type, with single rod, center control.
Clutch—Multiple dry disc, faced with asbestos, positive instant release.
Brakes—Two on each rear wheel, one internal, one external, 14" diameter drums—service brake interconnected with clutch pedal.
Steering—Gear and sector with 18" steering wheel.
Control—Left-hand drive, center control—spark and throttle on steering wheel with foot accelerator.
Positive—Thief-proof locking device.
Fenders—Drawn sheet steel of latest oval type—shield between running boards and body—close fitting, quick detachable under pan—aluminum bound, linoleum covered running boards.
Gasoline Capacity—18 gallons. Tank in rear with Stewart Vacuum system supply.
Body—Seven-passenger—touring car type with extra wide full "U" doors front and rear. Genuine No. 1 hand-buffed, enameled finished leather upholstery. Deep cushions and backs.
Finish—Body, Golden Olive—running gear, black—equipment nickel trimmed.
Equipment—Fully electric lighted throughout; improved 5-bow, one-man, mohair top with full side curtains; mohair slip cover; clear-vision, rain-vision, ventilating windshield; speedometer; electric horn; brackets; power tire pump; jack; complete tool and tire outfit; foot and robe rails.
Price—\$1250, f. o. b. Lansing, Mich.

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Index to Advertisers.

	Page
Ahlberg Bearing Co.....	78
Barrett Manufacturing Co....	67
Bosch Magneto Co.....	5
Boyd, F. Shirley.....	74
Coes Wrench Co.....	11
Culver Stearns Co.....	74
Detroit & Cleveland Nav. Co....	68
Dixon Crucible Co., Jos.....	78
Dover Stamping & Mfg. Co....	78
Du Pont Fabrikoid Co....	Cover
Eagle Oil and Supply Co.....	4
Eisemann Magneto Co.....	76
Goodyear Tire and Rubber Co....	75
Harris Oil Co., A. W.....	78
Hartford Mach. Screw Co.....	79
Heinze Electric Co.....	72
Hotel New Amsterdam.....	70
Hotel Tuller.....	76
Inter-State Motor Co.....	72
Marburg Bros.....	68
McQuay Norris Mfg. Co.....	73
Mea Magneto Co.....	68
Mecca Mfg. & Spec. Co.....	4
Metz Company.....	75
Milwaukee Auto Spec. Co.....	76
New Amsterdam Hotel.....	70
New Departure Mfg. Co.....	70
Nordyke & Marmon Co.....	75
N. Y. & N. J. Lubricant Co....	70
O-Zel-O Company, The.....	68
Peerless Motor Car Co.....	68
Reo Motor Car Co, The.....	2-3
Royal Typewriter Co., The....	8
Scripps-Booth Co., The.....	69
Searchlight Co., The.....	77
Splittorf Electrical Co.....	74
Springfield Metal Body Co....	9
Standard Oil Co., The.....	12
Staybestos Mfg. Co., The.....	71
Superior Mfg. Co.....	74
Texas Oil Co.....	78
Thermoid Rubber Co.....	72
Times Square Automobile Co..	4
Tuller Hotel.....	76
Vacuum Oil Co.....	Cover
Valvoline Oil Co.....	78
Vanderpool Co., The.....	4
Weed Chain Tire Grip Co....	72
Willys Overland Co.....	Cover
Winton Co., The.....	1
Zenith Carburetor Co., The....	Cover

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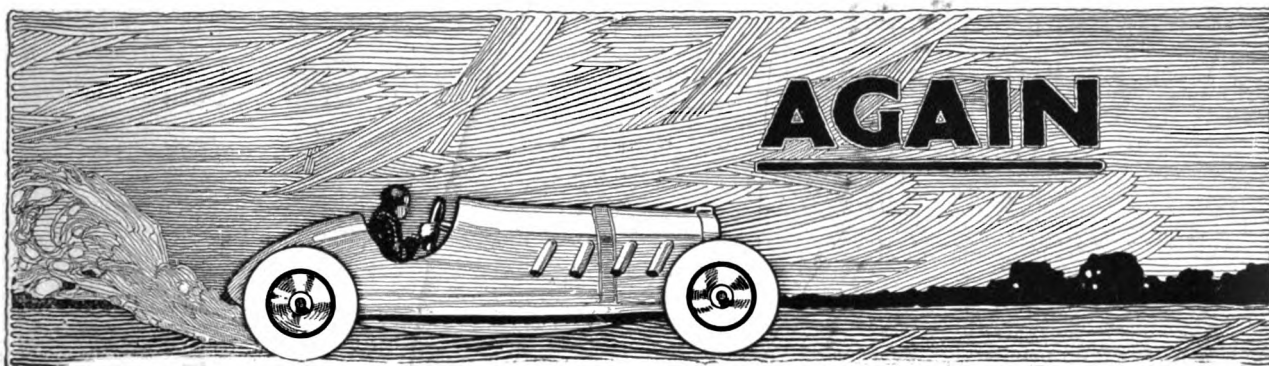
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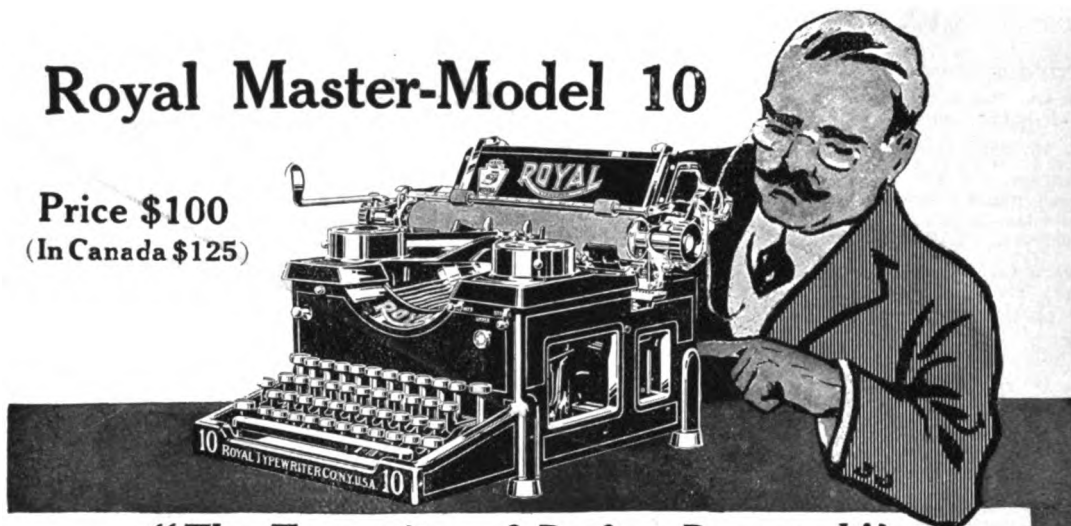
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THE flawless presswork of the new Royal Master-Model 10 carries the high-grade business message in as fine form as your thoughts themselves! Royal presswork reinforces the result-getting power of your business letters—for it adds the forceful stamp of *quality* to every letter you sign. Heretofore, you have been obliged to accept a standard of typewriting inferior to high-class printing, yet you would not accept poor printing. But with the new standard of "typewriter presswork" created by the **New Royal 10**, it is no longer necessary to accept inferior typing in your office.



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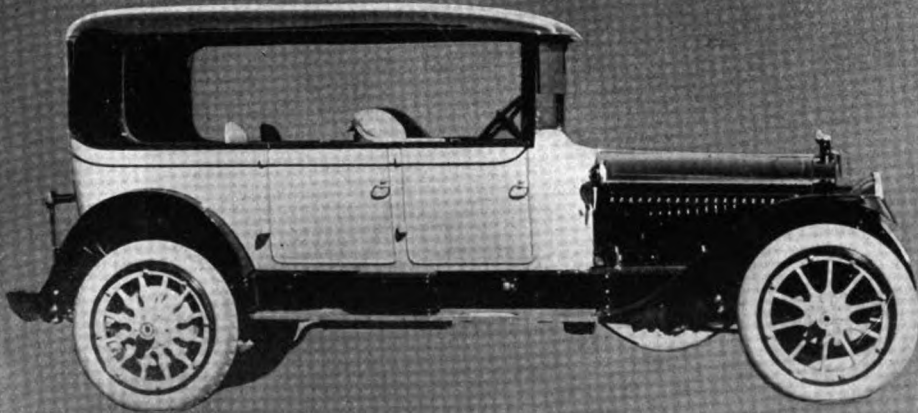
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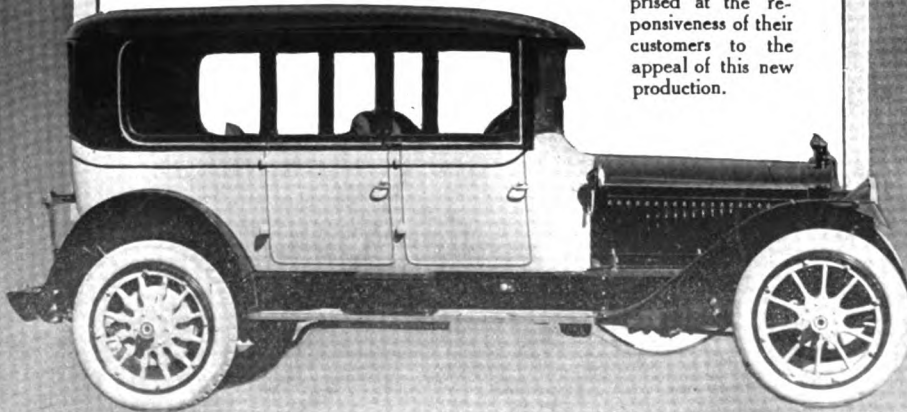
SPRINGFIELD CONVERTIBLE BODIES



THE limousine and the touring car are completely satisfactory only in certain seasons. The new Springfield Demi-Convertible body has no such limitations; it is the all-year, all purpose body.

More and more in America, as in Europe, the tendency is to demand protection from the sun, the dust and sudden showers even in touring. This body with its permanent top provides such protection, while it gives plenty of air and an unobstructed view. It may be converted into a limousine.

Dealers will be surprised at the responsiveness of their customers to the appeal of this new production.



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SPRINGFIELD, MASS.

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AUTOMOBILE JOURNAL PUB. CO.

Published the 10th and
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D. O. Black, Jr., Secretary.

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VOL. XL.

September 10, 1915.

NO. 3.

PUBLISHER'S AND READERS' PAGE.

THAT Detroit is Supreme in the manufacture of motor vehicles has been rather generally understood by the reading public. To ascertain the exact standing of the city, the editor, with much commendable enterprise, has thoroughly investigated the industrial situation and presents the results in this number of The Automobile Journal. The figures and facts given are not conjectural, but are an approximation of the statements of the Michigan manufacturers themselves. They are startling. They are conclusive. And they show that the automobile industry as a whole is in a thoroughly healthy condition and gives evidence of becoming the greatest purely industrial enterprise the world has ever seen.

Several Subscribers Have Asked if the Car Lighting and Motor Starting series now appearing in installments in this magazine can be obtained in complete form. The answer is that after the last installment has appeared, the separate chapters will be published in book form and sold to the public and practically at cost. The next installment, which will be presented in the Sept. 25 issue, will continue the discussion of the principles of motors, generators and motor-generators, after which the different equipments will be taken up individually and discussed in an exhaustive and interesting manner.

A Large Number of Readers have written to ask the most elementary questions concerning the economical operation, care and maintenance of the new car. For that reason the editor of the New Owners Department has begun a series of educational articles on the subject, the first of which appears in this number. The first chapter treats with the starting of the motor and has several practical suggestions upon what not to do—a very important factor in operating an automobile. The succeeding chapters will take up the starting of the car, the proper and most economical methods of lubrication consistent with maximum service, care and replacement of ball bearings, and similar sub-

jects that will prove of practical value to all new car owners.

The Mechanical Editor takes this means of expressing his appreciation to those subscribers who supplied the basis of many of the mechanical suggestions that have appeared recently in his department. It is his opinion that their quality is at par with those of the professional repairman, and he would gladly publish more worthy suggestions that any reader cares to send in. If desired he will give full credit, or will, if requested, conceal the identity of the writer. He realizes that many owners have mechanical short cuts and hints that other owners would be glad to learn about, and offers his co-operation in giving them wide publicity. Expressed in another way, he offers to devote a section of his department as a kind of a free exchange of ideas among subscribers.

Change of Address by Subscribers should be reported as soon as possible to this office. Because a large number of readers failed to attend to this matter, they did not receive several of their copies of The Automobile Journal. In this connection, it is well to advise all subscribers who do not receive each issue shortly after publication date to notify us at once, and the matter will be investigated without delay. In regard to the Touring Number, July 10 issue, however, it is now too late to remedy matters, for that edition and the several thousand extra copies have been distributed, and there is not a single copy left.

Partial Table of Contents.

	Page
*Detroit Makes Half the World's Cars...	13
*Stutz Cars Are Brilliant Winners.....	21
*New England Prisoners on Roads.....	23
General News of the Industry.....	25
*Highly Efficient Chemical Engine.....	29
*National Window Display Contest.....	30
*Motor Starting and Car Lighting.....	33
*Jeffery Four.....	37
*Car Accessories and Equipment.....	41
*Practical Motor Car Repairs.....	45
*National Highway Twelve.....	49
Over 2,000,000 Cars in United States....	52
*New Reo Light Delivery Wagon.....	53
*Industrial Happenings and Comment....	55
*Motor Vehicle News from Abroad.....	56
Prominent Race Event Abandoned.....	58
*Suggestions for the Ford Car Owner....	59
*Ford Car Accessories and Equipment....	63
*Practical Facts for New Car Owners....	66

*Indicates article is illustrated.

The Tendency Toward Dim Headlights is rapidly becoming national, and indications are that devices to that end will soon be compulsory in the majority of states. In the New Accessories Department the subscriber will find full editorial descriptions of such accessories, as well as descriptions of a large variety of other equipment for the automobile. All articles discussed are worthy of investigation and purchase.

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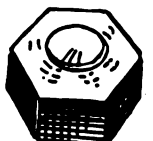
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HOW MANY CARS CAN YOU NAME?
Each radiator represents a well-known car.
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THE AUTOMOBILE JOURNAL

VOL. XL, No. 3

SEPTEMBER 10, 1915

Price, \$1.50 the Year

DETROIT MAKES HALF WORLD'S AUTOMOBILES.

Sixty-Seven Per Cent. of Motor Vehicles Made in the United States Are Built in Detroit and Other Michigan Cities.

DETROIT is supreme in the manufacture of motor vehicles. Approximately 67 per cent. of the 703,527 cars produced in this country during the fiscal year ending June 30, 1915, were made within her corporate limits and her suburbs. Furthermore, about half of the automobiles built throughout the world were constructed in Detroit factories, according to the estimate of a dependable statistician, who bases his figures on the most recently obtainable records.

The city's exact standing is shown in the following table, which is the result of a canvas of the manufacturers of that city and other Michi-

gan automobile industrial centres, and is an approximation of the statistics thus gathered.

Motor Vehicles Made in the United States and Detroit, with Estimate for Next Year's Production.

	1913	1914	1915	1916
United States.....	450,000	515,101	703,527	1,000,000
Detroit	238,000	350,000	475,000	800,000

With conditions in the automobile industry again as they were during its early years—when the problem was not of selling cars, but of forcing the factories to produce enough to meet the demand—Detroit continues to maintain her supremacy.

Its pre-eminence is, of course, largely founded



Detroit Plant of the Cadillac Motor Car Company, Where Approximately 20,000 Automobiles Will Be Built for 1916.

on its possession of the great central plants of the Ford Motor Car Company. This factory is turning out very close to one-half of the cars now produced in the United States. To this tremendous volume is also added the outputs of several other large Michigan makers, as is shown in the following table of production for 1915, which also shows conservative estimates of production for 1916 as announced by the companies themselves.

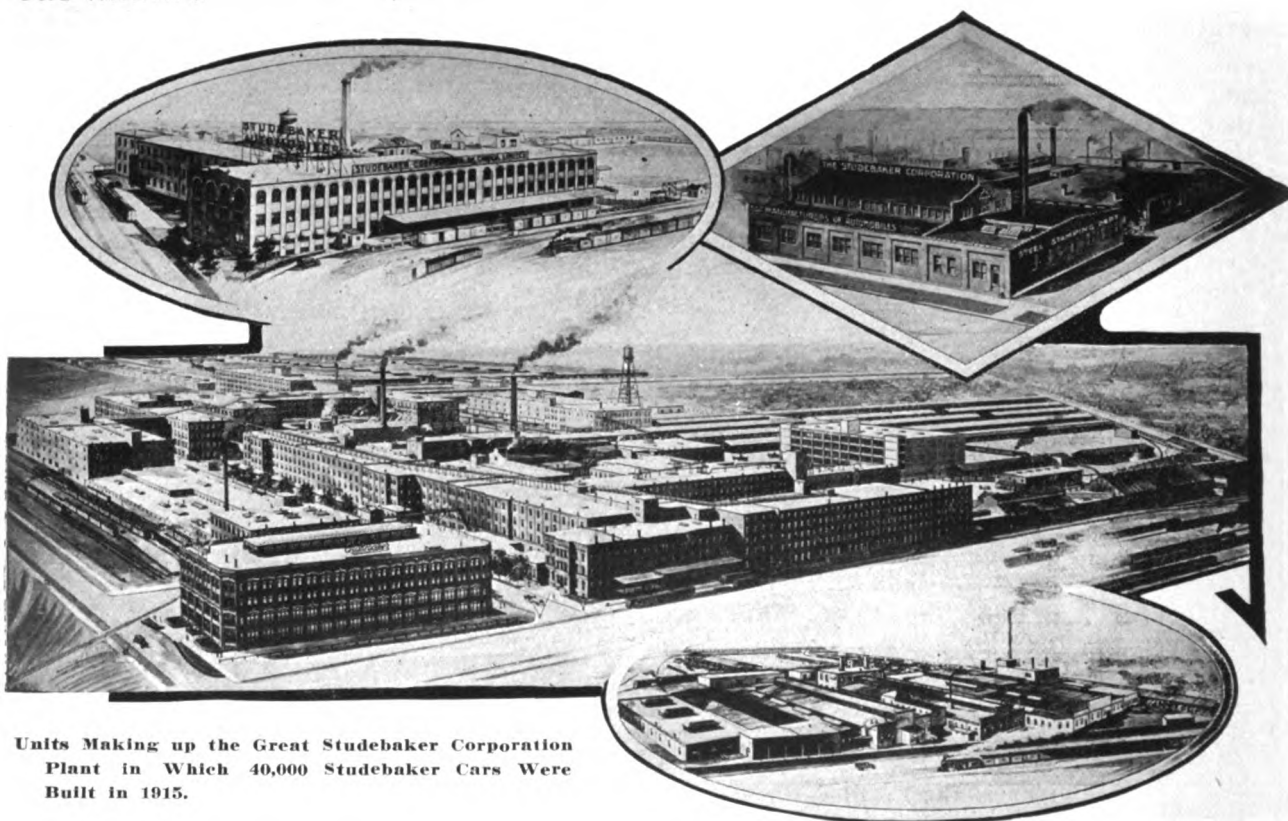
Estimated Productions of the Larger Michigan Manufacturers.

	1915	1916
Ford	308,213	600,000

investors to put their capital into the industry. The large companies have grown with a phenomenal rapidity that is the marvel of the present industrial era.

In fact, most of the recent new undertakings in the automobile industry have been started outside of Detroit. The vast resources and highly perfected organizations of the leaders in the trade make the difficulty of competition by a new company especially evident in Detroit, and result in conservatism by that part of investors.

Accurate figures compiled by the Detroit



Units Making up the Great Studebaker Corporation Plant in Which 40,000 Studebaker Cars Were Built in 1915.

Buick	45,000	60,000
Studebaker	40,000	60,000
Cadillac	13,001	20,000
Paige-Detroit	8,000	20,000
Oakland	5,000	20,000
Maxwell	65,000	Not given
Hudson	13,000	Not given

Despite the rapid growth of the output, and an equally rapid increase in the number of men employed, the number of manufacturing companies now active in Detroit is less than in 1912. Three years ago there were 33 companies making cars. At present there are 28. This would seem to indicate that as the older concerns become firmly entrenched in the market there is less tendency on the part of general

Board of Commerce on the number of employees in the automobile business in Detroit, and based on the average for the year round, rather than the highest number at any given time, show the following results:

	1912		1913		1914	
	Factor- ies	Em- ployees	Factor- ies	Em- ployees	Factor- ies	Em- ployees
Automobiles	33	37,067	29	45,783	28	42,408
Auto parts	100	19,976	105	21,649	84	18,427
Total....	133	57,043	134	67,432	112	60,835

These figures, however, scarcely give an adequate idea of the growth of the city through the influence of the automobile business. In 1900, before the automobile had begun really to de-

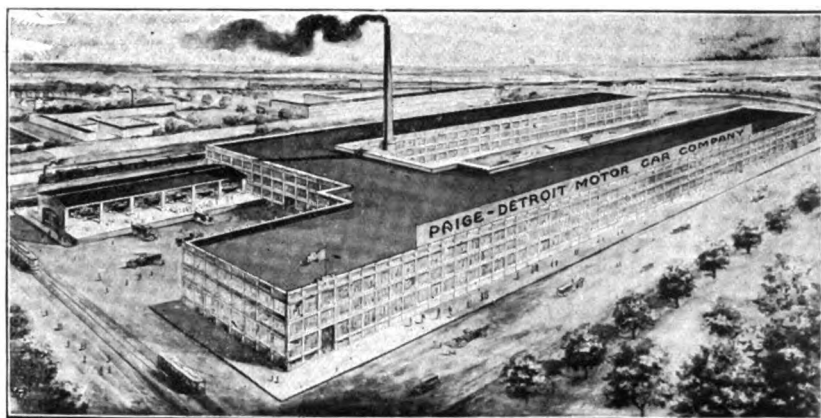
velop, the population of the city was slightly more than 200,000. In 1910, when the industry was well established, the United States census credited the city with 465,000. This was one of the greatest increases made by any American city, and was the sensation of the census report.

Figures based on the business done by the Detroit water department and the Michigan State Telephone Company, which have been found to be very conservative in the past and to underestimate rather than overestimate the true population, indicate that inside the city limits there are now 678,000 people, and in the city district, including suburbs which adjoin the town, 750,000.

Automobiles Chiefly Responsible.

There has been, of course, a healthy growth in other lines of business. But the greatest influence has been the development of the automobile industry. Each of the automobile workers has an average of three or four dependants and a larger number of store keepers, street car workers, doctors and persons in all other lines of business are necessary to serve this increased population. The automobile industry in Detroit would probably create in itself a city of 300,000 people.

In 1913 the 283,000 cars produced in Detroit were valued at \$208,000,000. In 1915, with a very greatly increased output at much reduced prices, the value of the output reached about \$350,000,000. The greatest number of men employed in the industry was about 75,000. The 1914 figures for output are estimated, there being no exact tabulation made by the Detroit Board of Com-



The Recently Enlarged Plant of the Paige-Detroit Motor Car Company, a Representative Factor in Detroit's Industrial Supremacy.

merce, and the government's tabulation has not yet been announced.

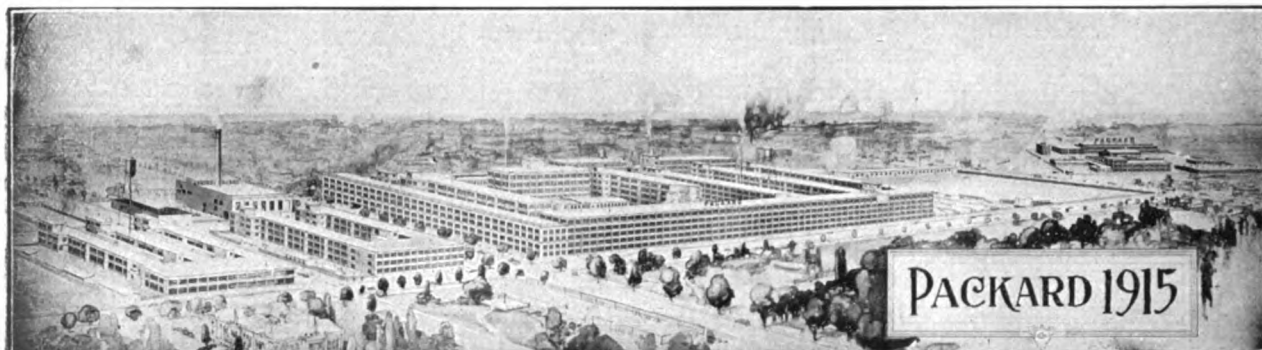
There is no secret in the fact, however, that while there was a large increase in the production of low priced cars, the business as a whole, and especially that concerned with higher priced cars, did not make the progress in 1914 that it has made in other years. The estimate, therefore, may err slightly on the high side.

Present Year a Record Breaker.

The present year, however, has made all that good. Not only have there been the largest exports of automobiles in the history of the country, due largely to the demand created by the European war, but the domestic sales have been greater than ever before. They have held up during the usually dull months of the summer. The farmer has entered the market in numbers that could not be foreseen. Prospects indicate a continued heavy domestic demand and the export trade far greater than any that has been known previously. This export trade is likely also to be permanent owing to the high quality



Plant of the Chalmers Motor Car Company from Which \$2,000,000 Worth of Cars Were Shipped During August.



Factory Units of the Packard Motor Car Company in De troit, to Which Are Being Added New Buildings to Take Care of 1916 Production.

which American manufacturers have learned to produce at low prices.

The estimated value of the total American product for 1915 has been placed at \$523,463,803, by Alfred Reeves, general manager of the National Automobile Chamber of Commerce. With the lowering of prices resulting from increased production and standardization of many parts, together with the present low cost of upkeep of automobiles, has come a demand that was never dreamed of by the greatest optimist a few years ago. The call for the big, luxurious cars continues, although the greatest sales during the past year have been in the rural districts, where the automobile's value as a time saver is appreciated in the highest degree.

Sales of pleasure or passenger cars of all types to June 30, which is the end of the year in the industry, were 665,826, for which the manufacturers received \$450,941,131. The sales of commercial vehicles of all types are estimated at 37,700, valued at \$72,522,692. The figures for the

12 months ending June 30, 1914, were 515,101 cars, passenger and commercial, valued at slightly more than \$485,000,000.

It will be noted that while the number of cars increased 36 per cent., the value increased only 10 per cent., which indicates the greater value the makers have been giving purchasers as manufacturing costs were brought down and fewer changes were made in chassis construction.

The enormous volume of business done by Detroit and other motor car companies is reflected in the movement of their stocks during the past year. The following table shows how greatly prosperity has grown and how future prospects have improved since Jan. 1:

Common Stock Quotations.

	Jan. 1	Sept. 1
General Motors	83 1/2	217
Maxwell	15 1/2	41 1/2
Packard	100	120
Peerless	15	140
Reo	22 1/2	33 1/2
Studebaker	36 1/2	112
Willys-Overland	83	182



View of One Section of the Ford Motor Company, Which Indicates the Magnitude of the Great Plant.



Latest View of the Pontiac Plant of the General Motors Truck Company, Whose Orders for 1915 Were Double Those of 1914.

Many other companies have made equal gains, but their stock is not dealt in on the exchanges, so that comparative quotations are not available.

Appreciation in the value of motor car stocks has been especially rapid since July 1, when the 1916 models began to be announced, and it became apparent that the demand for the latter half of the year would hold up in an unprecedented fashion. During that period the gain alone in value of the stocks outstanding for five companies is shown in this table:

	Stock out- standing	Price July 1	Recent high	Appre- ciation
General Motors...	\$16,501,000	155	224	\$11,385,090
Maxwell com...	12,783,000	84	92%	1,086,555
Maxwell 1st. pfd.	12,279,000	40	49	1,105,110
Studebaker.....	27,931,000	77	120	12,010,330
Willys-Overland	21,000,000	128	196	14,280,000
Total.....				\$39,867,685

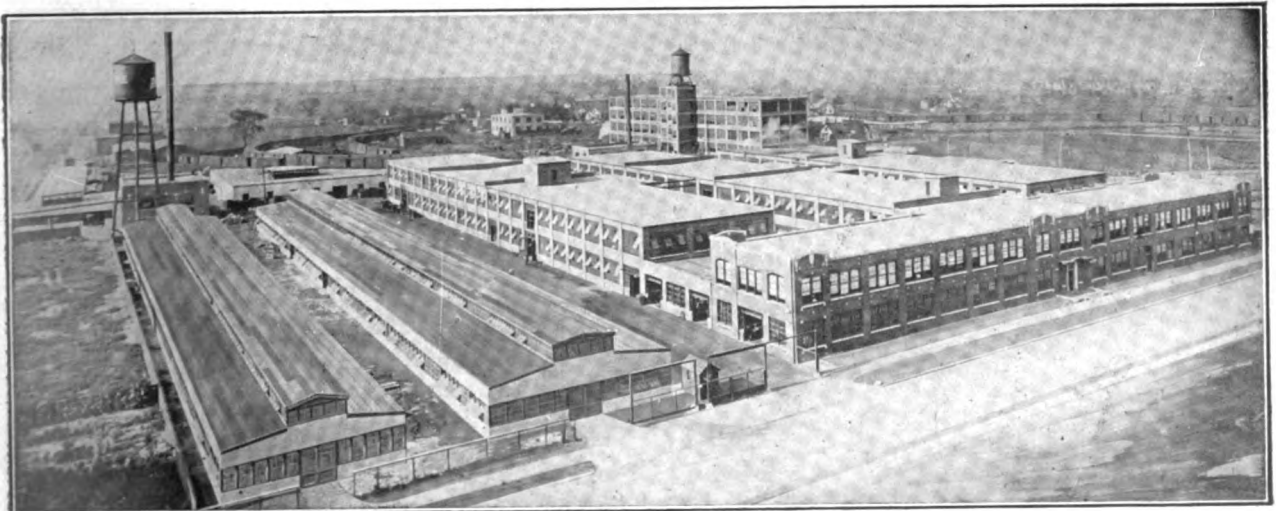
As an example of the vast profits that are being earned by the big concerns that have still succeeded in giving unheard of value to purchasers,

and have proved their ability to produce at lower prices better cars than the makers of other countries, notwithstanding the higher wages paid American working men, is shown by the following financial statements of the Studebaker Corporation:

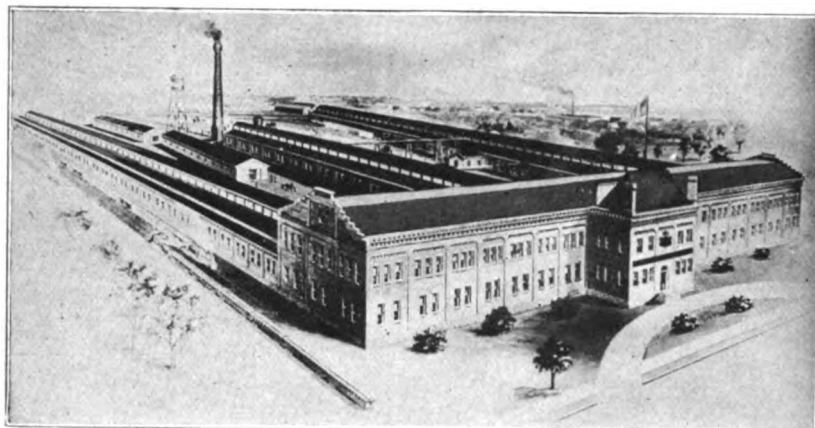
	Mfg. . profit	Total net	Bal. for com.	Earned on com.
1911.....	\$2,691,848	\$2,534,042	\$1,341,311	3.96%
1912.....	3,342,560	3,125,876	1,666,849	5.97%
1913.....	2,767,458	2,483,135	1,003,338	3.59%
1914.....	5,703,942	5,345,396	3,975,614	14.23%

	Current assets	Current liabilities	Working capital
1911.....	\$21,733,345	\$12,003,008	\$9,730,337
1912.....	21,554,757	3,469,728	18,085,029
1913.....	24,503,482	7,262,848	17,240,634
1914.....	23,707,876	4,343,869	19,364,007

The prosperity of the automobile industry has spread beyond the confines of the motor vehicle industrial centres, and a large share of its benefits is felt in nearly every phase of human endeavor in the country. As a single illustration of this fact there are the railroads, which collect about \$1,000,000 monthly in freight receipts on



Aeroplane View of the Hupp Motor Car Company's Plant, a Representative Manufacturer of Detroit.



Plant of the Mutual Motors Company at Jackson, Selling Company for Marmon and Imperial Cars.

automobile shipments. There are about 30,000 dealers' supply stores and garages that provide employment for capital in large bulk and for thousands of workers.

Enormous Material Supplies.

Still more remarkable is the activity brought about by the business in the various lines that supply material and parts to the automobile manufacturers. Perhaps far less than a third of the work that is necessary to deliver to the purchaser a finished automobile is done in Detroit and the other motor car centres. These figures regarding the material used in cars will give some conception of the influence of the business on other lines:

670,000 tons of fabricated steel.
 4020 tons of aluminum and alloy.
 2141 tons manufactured brass.
 1068 tons of curled hair.
 2050 tons of moss.
 67,232 hides (one-third hide per car).
 3,280,000 square yards imitation leather (eight yards per car).
 \$917,542 in upholstering fittings, such as cord, tape, buttons, snaps and similar trimmings.
 6,560,000 yards burlap, etc.

11,405,250 yards of top materials and linings, value approximately \$2,447,780.

7950 tons manufactured cotton, used in the carcass of automobile tires (on new cars only).

300,000 tons sheet celluloid.

9338 tons rubber and compound.

2,446,780 pairs of hinges.

2,446,780 door catch fittings.

489,356 square yards carpet for tonneau.

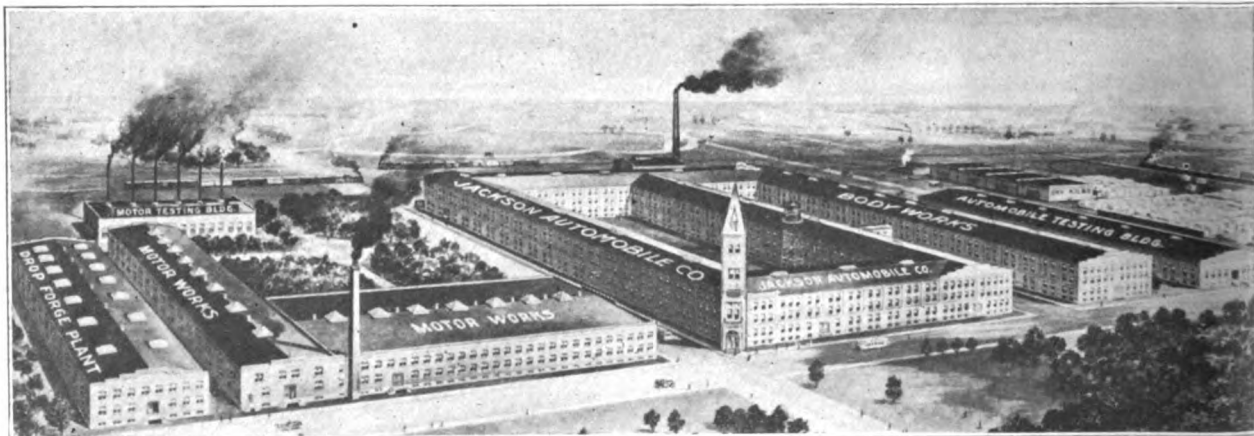
642,908 square yards linoleum for running boards and toe boards.

8,450,850 board feet manufactured hickory and other woods for floors, top bows, etc.

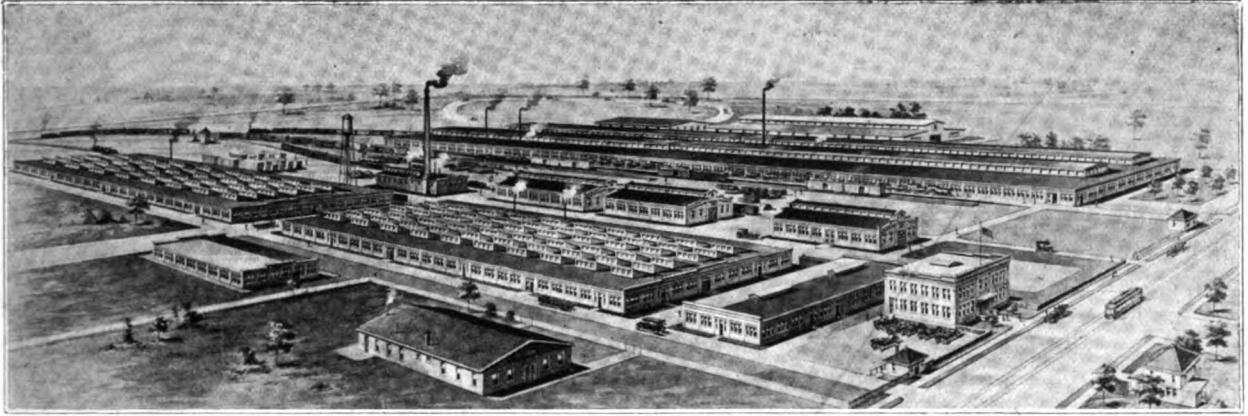
The automobile's position in the economic scheme of modern life is indicated by the following facts: There are more than 2,000,000 motor vehicles in

use in the United States today, which, incidentally, is about three times as many as there are in the rest of the world. The owners of these machines pay into the state treasuries annually in license fees the prodigious sum of \$13,259,440, according to the present rate. These same owners, either individually or through organizations, have set on foot the great good roads movement that is making the United States one of the greatest countries in the world from the standpoint of excellence of highways.

The automobile is proving a great factor in transportation problems, one of its influences already felt, and one that promises to increase in tremendous proportion, being the reduction of the cost of transporting food products from the producer to the consumer. In short, it is becoming more apparent every day that the social effects of the use of the motor vehicle are to be phenomenal and may eventually have an effect comparable even to the previous revolution in transportation methods which came with the de-



The Jackson Automobile Company's Plant at Jackson, One of the Best Equipped Motor Vehicle Factories.



Plant of the Maxwell Motor Company, Inc., Whose High Record of Shipments in 1915 Was 175 Cars a Day.

velopment of the railroad.

United States Greatest Market.

While the United States is a very much greater market than all the rest of the world, the export trade is, nevertheless, of importance.

Yet this is in itself a large business and it suffers only by comparison with the enormous outputs which are required for the American market. While 703,527 vehicles were produced last year in America, 37,870 were exported during the greatest export year the business has known. These 37,870 were valued at \$60,254,635, and about \$7,000,000 worth of parts were shipped in addition.

The distribution and value of exports from the United States is shown in the following table:

Vehicles	Destination	Value
13,934.....	United Kingdom	\$21,149,000
5,441.....	France	13,776,000
4,249.....	Russia and other Europe	10,720,000
2,316.....	Asia and other Oceania	4,557,000
4,433.....	Canada	4,428,000

3,186.....	British Oceania	2,670,000
1,264.....	South America	702,000

This represented an increase of 100 per cent. in the export business as compared to 1914. The increase in the number of vehicles was not so great, the total in 1914 being 29,090, but the value increased from \$33,198,806 to \$67,254,635.

Detroit is experiencing unprecedented industrial building operations for the future expansion of the automobile manufacturing industry. The estimated sum of \$5,000,000 recently announced falls far short of the plans of the companies, as indicated by a direct canvas of the company officials.

The Ford Motor Company is putting in a new power house that will cost approximately \$1,000,000, and will equip it with machinery valued in the neighborhood of \$1,500,000. The Hudson company is spending about \$1,500,000 for enlargements to its plant. Packard additions are



Olds Motor Works, Lansing, Whose Estimated Production for 1915 Is Four Times That of 1914.

costing about \$750,000. The Paige-Detroit company is expected to spend more than \$200,000 for a new warehouse and assembling plant. Chalmers is expending \$165,000, and Dodge Brothers' new test shed for storage and final inspection is estimated to have a cost value of \$25,000.

The Studebaker Corporation has added a new steel stamping and enamelling plant, the building comprising four stories and measuring 220 by 80 feet. The Standard Motor Truck Company is making several enlargements to the plant and during the next few months will add at least 25,000 square feet. The Scripps-Booth Company has within one year outgrown its factory quarters and recently purchased ground for the erection of a three-story fireproof building for manufacturing purposes. The new factory will have capacity for 100 cars a day.

The Federal Motor Truck Company's new two-story addition, 60 by 120 feet, is nearing completion, and it is probable that another big addition will be necessary.

S. A. E. ADOPTS STANDARDS.

The letter ballot of the Society of Automobile Engineers on the proposed standards that had been approved by the standards committee, has resulted in the adoption of all the standards by a large majority.

Only one proposal received any number of negative votes, and that was for the elimination of the gray iron casting specification. There were seven votes cast against this proposal to 87 in favor. Members were urged to vote on any proposal they felt qualified technically to judge and 154 ballots were cast.

NEW DANIELS EIGHT-CYLINDER.

George E. Daniels, formerly vice president and general manager of the Oakland Motor Car Company, is to begin shortly the production of an eight-cylinder car at Reading, Penn. It will have a Herschell-Spillman motor and will be practically a custom made car. The streamline body will be made in five and seven-passenger touring types. The wheelbase will be 127 inches and price the will be in the neighborhood of \$2350.

TRUCK CAPACITY STILL AVAILABLE.

Although many American truck factories are wholly occupied with war orders for the allies

and vast quantities of trucks are being made, there is still available much capacity for motor truck construction that could be used if it were necessary. One well known exclusive passenger car manufacturer began to study trucks 10 years ago and has had experimental models under observation all of that time. These models have been kept up to date and drawings and production charts are always at hand, so that production could begin on a day's notice if it were required. The truck is an internal gear drive type.

MOLINE-KNIGHT CUTS PRICE.

A reduction of \$100 in price has been made by the Moline Automobile Company, East Moline, Ill., on its Moline-Knight 40. The engine has been increased in size to 3¾-inch bore by five-inch stroke. Otherwise the car is identical in quality to that produced by the company last year. Filled with gas, oil and water and ready for the road the car weighs 2896 pounds. It has 118-inch wheelbase.

COMING EVENTS.

September.

- Sept. 11—Track meet, Burlington, Ia.
- Sept. 11—Track meet, Erie, Penn.
- Sept. 13—Pan-American Road Congress, Oakland, Cal.
- Sept. 13-17—Show, Milwaukee, Wis.
- Sept. 14—Track meet, Punxsutawney, Penn.
- Sept. 17-18—Illinois Garage Owners' Convention, Peoria, Ill.
- Sept. 18—Track meet, Butler, Penn.
- Sept. 18—Speedway races, Providence, R. I.
- Sept. 18-25—Show, Los Angeles, Cal.
- Sept. 20-25—International Engineering Congress, San Francisco.
- Sept. 24—S. A. E. meeting, Indianapolis, Ind.
- Sept. 24-25—Track meet, Grand Rapids, Mich.
- Sept. 27-Oct. 10—Show, Denver, Col.

October.

- Oct. 1-2—Track meet, Trenton, N. J.
- Oct. 2—Speedway races, New York City.
- Oct. 2—100-mile race, Fresno, Cal.
- Oct. 2-9—Show, Cincinnati, O.
- Oct. 4-9—Show, St. Louis, Mo.
- Oct. 4-6—Garage Owners' Convention, Columbus, O.
- Oct. 6-16—Electrical show, New York.
- Oct. 9—100-mile invitation race, Indianapolis, Ind.
- Oct. 9—100-mile race, Mattoon, Ill.
- Oct. 11-12—Convention National Paving Brick Manufacturers, Dayton, O.
- Oct. 14—S. A. E. Standards Committee Meeting, Chicago.
- Oct. 16—Speedway races, Chicago.
- Oct. 16-22—Show, Montreal.
- Oct. 16-23—Show, Pittsburg, Penn.
- Oct. 17-18—Convention Electric Vehicle Association of America, Cleveland, O.
- Oct. 18-24—Show, Troy, N. Y.

November.

- Nov. 1-3—Show, Pasadena, Cal.
- Nov. 20—Road race, Carona, Cal.

January.

- Jan. 1-8—Show, New York City.
- Jan. 22-29—Show, Chicago.
- Jan. 24-29—Show, Buffalo.
- Jan. 29-Feb. 5—Show, Minneapolis, Minn.

March.

- March 4-11—Truck show, Boston, Mass.

STUTZ CARS ARE BRILLIANT WINNERS.

Cooper and Anderson Again Finish First and Second, Only a Fraction of a Minute Apart, at Twin Cities—Not a Single Foreign Car Finished.

STUTZ cars in another brilliant feat of speed and endurance at the new Twin City speedway, took first and second in one of the most exciting finishes ever seen in a 500-mile race and added to the glory of the Stutz name. These astounding American racing cars are rapidly forcing recognition as the greatest that have ever been built, either in America or Europe.

The time was comparatively slow, both cars making the course at 86.35 miles per hour. According to the electric timing device, Cooper finished 21/100 of a second ahead of Anderson, his teammate.

The result was distinctly a disappointment to the builders of the Twin City concrete speedway, who had hoped that it would prove the fastest track in the country. It had been found impossible, however, to lay the cement evenly, and in spite of the scientific banking, the ripples in the surface made the track not only slower than Chicago, or even Indianapolis, but deadly to any but the strongest cars. It may be possible to make the surface smoother and this will be attempted.

Out of 14 entrants, who included all the stars of the Indianapolis and Chicago races, only six finished, and every one of them used an American car. The foreign cars, without exception, were unable to withstand the terrific vibration caused by the uneven track, and one by one they went out.

The result, in fact, was another great victory for Stutz strength and consistency rather than Stutz speed. It has been shown in previous races that while the Stutz cars can be outdistanced under the most perfect running conditions by the Mercedes and Peugeot, they can maintain with amazing steadiness and lack of mechanical trouble, a steady and fast pace.

FINISH IN 500-MILE TWIN CITY RACE.

	Time per hour	Miles
Earl Cooper, Stutz.....	5:47:29.00	86.35
Gil Anderson, Stutz.....	5:47:29.21	86.35
E. O'Donnell, Duesenberg	6:20:25.00	78.86
Tom Alley, Ogren.....	6:24:44.00	77.94
C. F. Halbe, Sebring....	6:38:17.00	75.33
Billy Haupt, Duesenberg	6:45:18.00	75.29

At Elgin, at Minneapolis and in most of the races where the track conditions put a hard strain on the cars, Stutz has shown greater stamina than its foreign rivals. Of course, one factor in this success is the fact that the Stutz factory is close at hand and can be relied upon for the utmost co-operation in keeping the cars in shape, while the Peugeot, Mercedes and Delage are shut off from factory aid of any kind. Those cars are showing the effects of hard usage in previous races, and it is impossible to get them into the mechanical form which they showed in the early races of the year.

Large Prizes Are Offered.

The prize for the Twin City Derby was \$50,000, as it had been for the 500-mile races on other tracks. Of this Cooper won \$20,000, Anderson \$10,000, O'Donnell \$4500, and the remainder of the \$50,000 was divided between the three other riders to finish. Their prizes were larger than they would have been had 10 cars finished, as had been expected.

Resta led from the pole position at the start with his usual speed and held the lead for some laps. On the sixth lap trouble began when Oldfield's Delage threw a tire. Burman's Peugeot broke a piston at 32 miles, and he left the track.

At the end of 50 miles, Cooper was leading, with Resta second. This 50 miles was made at a speed of 90.5 miles per hour. Gil Anderson began to press the leader during the second 50 miles.

At 100 miles he led, with Cooper second and De Palma third. Anderson's average for the first 100 miles was 90.91. On his 104th mile Anderson stopped for a tire and Cooper took the lead again.

A broken oil pump put Resta out of the race at 102 miles. Henning, in a Mercer, went out just before Resta quit. Ralph Mulford was ruled off

ENTRIES FOR TWIN CITY DERBY.

Car	Driver
Peugeot.....	Dario Resta
Peugeot.....	Ralph Mulford
Peugeot.....	Bob Burman
Mercedes.....	Ralph de Palma
Stutz.....	Gil Anderson
Stutz.....	Earl Cooper
Duesenberg.....	Eddie O'Donnell
Duesenberg.....	Pete Henderson
Duesenberg.....	Billy Chandler
Delage.....	Barney Oldfield
Mercer.....	Otto Henning
Sebring.....	O. F. Halbe
Ogren.....	Tom Alley
DuChesneau.....	W. W. Brown

the track by the referee because he was driving with a dangerously broken frame. At 170 miles Cooper stopped and his car was driven for



Harry S. Harkness, New President of Sheephead Bay Speedway.

about 80 miles by Johnny Aitken. Anderson stopped at 180 miles and accepted the services of a relief driver for a time. The Stutz team now had the race firmly in hand, all their really dangerous rivals having been retired, and for the remainder of the race they saved their cars.

The cost of the plant is estimated by the builders as follows: 342½ acres of land, \$175,000; grading, \$100,000; track, \$250,000; stands, \$150,000; fences, \$100,000; tunnels, \$70,000; buildings, \$25,000.

FISHER RESIGNS FROM SPEEDWAY.

Carl G. Fisher, head of the Indianapolis speedway, has resigned the presidency of the Sheephead Bay Speedway Corporation. He said in his letter of resignation:

"I am not satisfied with the way in which the affairs of the company are being handled. I accepted the office on the distinct understanding, among other things, that no contracts would be entered into that did not receive my approval. This, as well as other understandings, has not been carried out."

Harry S. Harkness of Cleveland and New York, son of a Standard Oil magnate, has been elected to the position. He drove in many contests in the early days of automobile racing and in 1904 won the Mount Washington hill climb in a Mercedes.

VINCENT ASTOR CUP FOR OWNERS.

Conditions under which Vincent Astor has presented a silver cup to be competed for at the Sheephead Bay Speedway, have been made

known. The cup is to go to the entrant of the cars and not to driver. The cup itself has been finished by the jewellers and is described as simple and of chaste design to fit it for a place on a gentleman's mantle. It rests on an ebony base and is 28½ inches high and 20 inches wide. It will be competed for five times at intervals of one year, and its final winner will be decided on points. First place counts 20 points for the cup and 10th three points, with intermediate positions scoring accordingly.

DE PALMA WINS AT KALAMAZOO.

Still another victory for the Stutz was gained on the one-mile dirt track at Kalamazoo, Mich., Aug. 28, when Ralph De Palma won a 100-mile race at a speed of 65.32 miles per hour. He did not stop at his pit at all during the 100 laps of the track.

Bob Burman, who won the Kalamazoo race last year, took second place, this time finishing two laps behind the victor. This year's time was 58 seconds faster than that in 1914. In the first part of the race there was a sensational struggle between De Palma and Burman for the lead, but in the 27th lap Burman blew a tire and the Stutz went ahead and was not again overtaken.

Billy Chandler, in a Duesenberg, was third, and fourth and fifth places were won by Patrick's

Mercer and Ball's Buick. The six other starters were Burt's Stutz Special, Klein's Cornelian, Hursh's Submarine Special, Hale's Buick, Buzane's De Dietrich and Valdez's Buick. The only accident occurred when Klein's Cornelian crashed through the fence. Neither driver nor car were injured.

About 15,000 people saw the race. De Palma won \$1000.



The Astor Cup—Prize Offered for Sheephead Bay Races.

NEW ENGLAND PRISONERS ON ROADS.

THE first use of prisoners on New England roads has been made in Cumberland county, Maine, and, according to John C. Scates, secretary-treasurer of the Maine Automobile Association, the experiment has been very successful. An average of 40 prisoners are worked on the roads from a central camp under the direction of the State Highway Department, but the care of the prisoners is in the hands of the sheriff and the county commissioners.

Work is being done on the road to the White mountains at a point about 20 miles from the jail in Portland. The prisoners erected a camp large enough for 40 single spring beds, with a wardrobe room at one end. The men undress in this room and hang their clothes on individual hooks. At night they put on robes and their clothing is locked up so that if they attempted to escape they would have only the night robe to wear.

Close to the camp an old house was leased as quarters for the guards and foremen. A lean-to dining room was erected for the men. Sanitary conditions are closely watched and the men bathe frequently in a nearby pond.

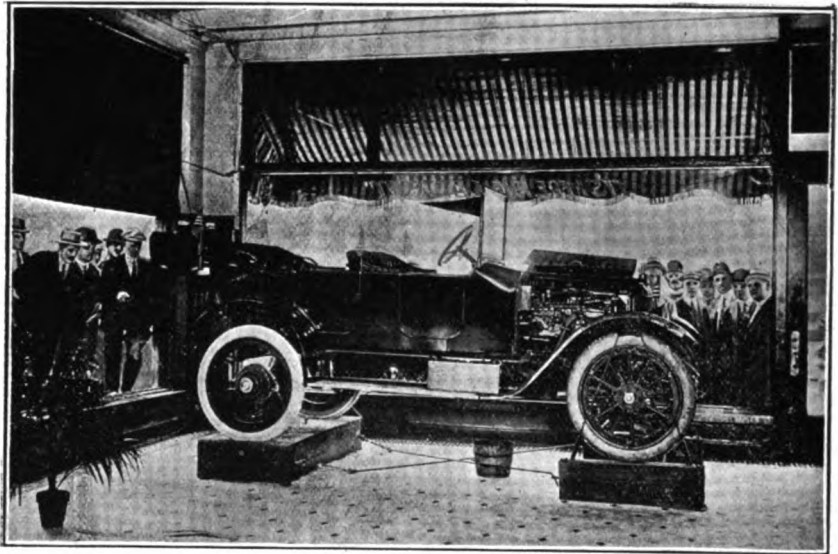
There is said to be marked improvement in the health of the men after they have been in the camp a short time. They consume about 45 cents worth of plain wholesome food a day, as compared to 15 cents worth in jail. The men dress like other laborers and cannot be distinguished from the ordinary road crew. After dinner they pitch quoits, play ball or do what they please about the camp until 8 o'clock, when they prepare for bed.

Each day's labor is worth to the state about \$1.75, as the men are as efficient as other workers. In jail the county got nine cents a day for their work and had to feed them in addition.

RUNS CAR IN WINDOW 30 DAYS.

In the window of the Simmons Motor Car Company, Chicago, a Grant "Six" was mounted on a tread mill and run day and night for 30

days. Six tire changes were made during the run and except for about 10 minutes, each time to make those changes, the motor was never stopped. According to the speedometer the car travelled an equivalent of 14,854 miles. It consumed 429½ gallons of gasoline and 15¾ gallons of oil. The average speed of the car was 20¾ miles per hour. There was no trouble with the cooling system, which required 19 gallons of water during the grind. The mileage of 34 miles to the gallon was greater than is usual by about 10 miles, as a car loaded and overcoming wind resistance has been found to average 24 miles



Grant "Six" Undergoing 30-Day Treadmill Test in Chicago Dealer's Window.

to the gallon. Oil was consumed at the rate of one gallon every 900 miles, which is about the normal consumption of the car.

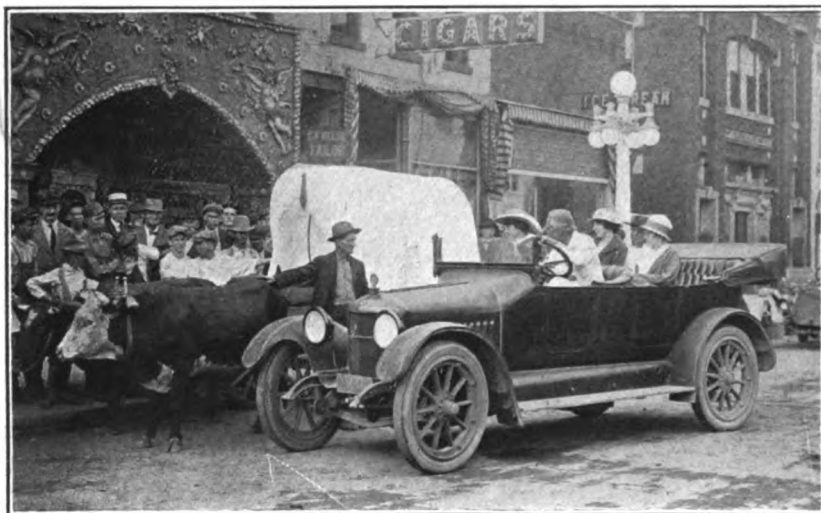
Anita King, the moving picture actress, who is leading woman of the Jesse L. Lasky Feature Play Company, is to cross the continent from San Francisco to New York City in a KisselKar 42-six unaccompanied. She is an expert driver and has contended in several races. She knows the KisselKar thoroughly, having driven one for seven years, and she expects to make all of her own adjustments and repairs on the road. She will carry a camping outfit, a rifle and an automatic revolver. Her route will be that of the Lincoln highway. She will not try for a speed record, but expects to reach New York City in about three weeks.

WAR SAVES \$350,000,000.

Estimates of the amount of money saved by Americans who have stayed at home instead of touring Europe this year place the amount at \$350,000,000. Of this sum \$86,950,000 formerly went for steamer fares and the remainder for travelling expenses in Europe. A considerable proportion of this money has been spent for automobiles and motor touring in the United States.

DIXIE HIGHWAY NOW IS "FILMED."

Moving pictures of the Dixie highway are being made to aid in stimulating enthusiasm for that enterprise throughout the South. The accompanying picture was taken near Martinsville, Ind., to illustrate the difference in the character-



Modes of Travel 25 Years Ago and Today—"Filming" the Dixie Highway from a Premier 6-50.

istic traffic over the road 25 years ago and this year. The team of oxen shown is owned by J. H. Boyer, Bear Wallow Hill, Brown county, and is still used on his farm. It was driven 26 miles to get into the picture. In the Premier 6-50, with which the oxen are contrasted in the picture, is W. S. Gilbreath, field secretary of the Dixie highway, and several young ladies of Martinsville.

TOURING CONDITIONS IN FRANCE.

A letter has been received by the Automobile Club of America from Fredrick Southwick, one of its members, who is making a tour of France in spite of the war, in which he declares that he is having no difficulty at all in making an ex-

tended tour through the country. Officials readily grant permits to travel through a specified area, and for long trips safe conducts are supplied. Good hotels are open at nearly every point and accommodations are somewhat cheaper than they were before the war began. Gasoline is higher, but can be obtained easily.

TIRE INFLATION AND WEIGHT.

With 2,000,000 automobiles in the country, and an average consumption of six tires per car, the number that will be used next year is figured by P. W. Litchfield of the Goodyear Tire and Rubber Company at 12,000,000 tires. These will cost an average of \$16 each, or \$192,000,000 in total.

One-third of the cost of these tires, or \$57,600,000, will be wasted by careless inflation. The real basis for the amount of pressure to be used in a tire is the amount of weight it must carry. The degree to which it is flattened against the ground in service is in direct ratio to the weight which it bears.

The way to find the weight on any tire is to load the car fully and then weigh first the front and then the rear end. These totals divided by two will give the weight on each tire. When that is accomplished the tire should be inflated to the pressure indicated in the following table for the weight it must bear.

This method adjusts pressure to the weight the tire must bear as nearly as it is possible in practical use. There are variations, of course, due to the changing load in the car that cannot be overcome.

GROSS CARRYING CAPACITY, POUNDS PER TIRE, INCLUDING PASSENGERS AND COMPLETE EQUIPMENT.

Inf. Press	Tire Section Diameter.						
	3"	3½"	4"	4½"	5"	5½"	6"
30	250	..	..	..	..	..	..
35	290	360	..	..	..	..	..
40	335	410	500	..	..	..	..
45	375	460	560	675	..	..	..
50	415	515	625	750	875	1000	1140
55	460	565	690	825	960	1100	1255
60	500	615	750	900	1050	1200	1370
65	..	670	815	975	1135	1300	1480
70	..	720	875	1050	1225	1400	1595
75	..	..	940	1125	1310	1500	1710
80	..	..	1000	1200	1400	1600	1925
85	..	..	..	1275	1485	1700	1940
90	..	..	..	1350	1570	1800	2050
95	..	..	..	..	1660	1900	2165
100	..	..	..	..	..	2000	2280

GENERAL NEWS OF THE INDUSTRY.

Scarcity of Raw Material Hinders Production—President of Locomobile Company Dies—Firestone Reports Big Business—Ford Offers \$10,000,000.

AUTOMOBILE manufacturers and makers of parts are facing the problem of getting deliveries of raw material, especially steel and aluminum. During the dull steel years of 1913 and 1914, when the general steel industry was on the down grade, it was the automobile industry that stemmed the tide. Today the automobile industry is still demanding steel, and in larger quantities, but the steel makers are so engrossed with war and other orders that the motor vehicle makers are being hampered in making their cars.

One of the largest makers in the industry is being held back to a production 20 per cent. below what he could sell. Another manufacturer, a maker of one of the highest grade of cars, has been able to deliver less than 10 per cent. of his anticipated output of 1916 models.

However, it is anticipated that in October, the usual six months of slackened automobile production will relieve the strain on the steel production.

The Packard company announces that actual production of the Twin Six in quantities has been delayed owing to the inability to obtain raw material. The J. C. Wilson Company, Detroit, manufacturer of Wilson trucks, declares, "We cannot emphasize too strongly the fact that the scarcity of material, at the present time, is very embarrassing, axles and motors being the hardest to obtain of any of our parts. We have actually had to refuse orders on account of this material condition."

The Federal Motor Truck Company, Detroit, also reports unsatisfactory material conditions. "If we were able," an official said, "to get as many parts as we wanted from various parts manufacturers upon whom we depend for many of our units, we would have been able to produce many more times as many trucks as we have."

LOCOMOBILE PRESIDENT IS DEAD.

S. T. Davis, Jr., died in Bridgeport, Aug. 31, of hemorrhage of the brain. He held the degree of civil engineer from the Rensselaer Polytechnic Institute of Troy, N. Y., and in 1900, at the age

of 27, became secretary of the Locomobile Company of America. Two years later he became president.

He had been active in the National Automobile Chamber of Commerce and in the organizations which preceded it. He had interests in real estate and banking. He was a member of the New York Yacht Club, Automobile Club of America, Ardsley Club, Brooklawn Country Club, Automobile Club of Bridgeport, Algonquin, Seaside, Bridgeport Yacht Club, the University Club of Bridgeport and the University Club of New York.

FIRESTONE INCREASES DIVIDENDS.

The Firestone Tire and Rubber Company, Akron, O., has declared a special dividend of four per cent. on the common stock, and has fixed the rate for 1916 at 20 per cent.

The financial report submitted at the annual meeting of stockholders held recently and at which all directors were re-elected, showed that sales during the fiscal year had increased by 31 per cent. over the preceding year. They totalled \$25,187,884, showing an increase of \$5,937,774.

The detailed statement is as follows:

Quick Assets.	
Accounts receivable	\$5,269,034.30
Bills receivable	123,480.91
Cash (reserved for new buildings and equipment contracted for)	800,000.00
Cash	1,103,427.64
Stock sold employees	112,200.11
Material and finished goods	3,843,477.83
Liabilities.	
Accounts payable	\$675,064.79
Net quick assets	10,576,556.00

H. S. Firestone, president, announced that the company would continue its operations on the same conservative basis as heretofore.

\$10,000,000 FOR PEACE.

Henry Ford continues his plans for the benefit of humanity and makes three announcements of vast importance in their respective fields.

Probably first in importance is the announcement that the Ford Motor Company will employ convicts from the state prison at Jackson, Mich., as fast as they were released from durance.

The second announcement is that Mr. Ford will follow his recent offer of \$1,000,000 for purpose of bringing the peace question before the public with an offer of \$9,000,000 more, if needed. In making the announcement, Mr. Ford said: "I believe thoroughly that education is necessary to insure peace in the United States. The people must be taught that the glamor and glory painted into war pictures are false. They must be shown that preparedness for war creates war. They must learn how their taxes are used for military preparations in times of peace only to be wasted along with their lives in times of war."

The third announcement was that the new farm tractor would be made in Canada by his company there, which will require the addition of 10,000 workmen to the force. It is understood that the possibility of the tractor being manufactured in Canada is responsible in large measure for the sudden jump of the Canadian stock from par to \$1500.

WESTFIELD PLANT INCORPORATED.

The Westfield Manufacturing Company, which has taken over the Westfield plant of the Pope Manufacturing Company, has been incorporated under Massachusetts laws for \$1,200,000; 4000 preferred and 8000 common shares. The preferred is convertible into common. The company will manufacture and deal in bicycles, motorcycles, automobiles, aeroplanes and in guns and ammunition and the incidentals thereto. The seven per cent. cumulative preferred stock is redeemable at 110. An issue of 2000 preferred shares is for cash, and 2000 for location. Ten shares of common are issued for cash, 490 for location, 1000 for machinery, 3500 for merchandise and 3000 for bills receivable.

\$400,000 AUTO COMPANY FORMED.

The All-Steel Motor Car Company, a new \$400,000 corporation, has been formed in Missouri and will be located at Macon, Mo., for manufacture of a new type of popular-priced automobile. It is said the company will make two styles of cars, a roadster to sell at \$350 and a touring car to sell at \$400.

The roadster will weigh 700 pounds and the touring but little more. The body of the car will be made of one piece 22-gauge steel. The sides will be welded to the floor and the whole will be removable from the running frame. Solid disc wheels will be used.

Gen. E. J. Spencer is president of the new

company, and O. A. Trolicht is secretary. Among those financially interested are George W. Simmons, James E. Smith and John E. Pilcher.

SMITH TO EDISON'S DETROIT OFFICE.

Bertram Smith, well known in the storage battery business for the past 15 years, has been appointed manager of the Detroit office for the Edison Storage Battery Company. Mr. Smith joined the Edison interests a year and half ago as assistant manager of the San Francisco branch. Previous to that he had been manager of the battery department in the Chicago branch of the United States Light and Heating Company. He was formerly secretary and treasurer of the National Battery Company of Buffalo. The Cleveland branch of the Edison company, recently removed to Detroit, is located in the new David Whitney building. The rapidly growing volume of business in the territory is expected to make it one of the company's most important branches.

GOODRICH SALES LARGE.

For the past two months the sales of the B. F. Goodrich Company have been unusually large, and cash on hand is said to amount to \$5,000,000. Net profits for the first six months of the year were \$4,000,000, which will make the profit for the year about two million greater than usual. Earnings have been applied to the retirement of part of the large amount of outstanding securities, but it is the general belief at the meeting in November or at the first meeting in 1916 that the stock will be put on a four or five per cent. basis.

L. J. OLLIER PROMOTED.

L. J. Ollier has been made vice president, director and director of sales of the Studebaker Corporation, succeeding Ernest R. Benson. In the 90's he was a bicycle salesman and became manager of the Chicago branch of the American Bicycle Company. When that company entered the automobile business he sold some of the first motor cars placed in Chicago. He joined the Peerless Motor Car Company there, was manager of the Cadillac Company of Illinois, and sales manager for Ralph Temple, a leading dealer. He then went to California, where he became an accessory jobber, selling out that business to take charge of the Studebaker Los Angeles branch. He made that the leading branch

owned by the company and was then called to the factory to become sales manager. He held that position until his recent promotion. He is a strong believer in service and has been working out many new service plans for the Studebaker company.

R. T. Hodgins becomes sales manager of the company, with George L. Willman and William T. Bush as assistants. Mr. Willman, who has been advertising manager, will continue to have supervision over that department and will handle dealers and salesmen west of Detroit and Mr. Bush those east of Detroit.

PACKARD FOR PREPAREDNESS.

As further evidence that Henry B. Joy, president of the Packard Motor Company, is in earnest in his declared belief in the military preparedness of the country, comes the announcement of Sept. 8 that the company would pay a bonus to all its employees in the militia or training camps.

The announcement states that any Packard employee shall be granted a leave of absence at any time he is eligible to take part in any military tour of instruction, naval reserve cruise or national guard encampment. Such absence will carry with it full pay for the entire period and the time will not be deducted from the employee's vacation.

LOWER PENNSYLVANIA TIRE PRICES.

A substantial downward revision in the prices of Pennsylvania Vacuum Cup Tires in the smaller popular sizes, taking effect Sept. 1, has been announced by the Pennsylvania Rubber Company. This action is taken without any reference to prices in the market at large, and is the result of increased capacity of the Pennsylvania plant and lower cost of production.

MILLER GOODRICH MANAGER.

Harry C. Miller has been made sales manager of the pneumatic tire department of the B. F. Goodrich Rubber Company, succeeding F. I. Reynolds, who resigned the position in June. He will have entire charge of marketing both Goodrich and Diamond pneumatic tires. For some years he was the company's Detroit representative, handling its sales to car manufacturers and more recently has been Pacific Coast manager with full charge of western sales of all sorts and of export trade with the Orient. He is thorough-

ly fitted by experience to undertake the management of all the company's tire sales.

WATSON HEADS HAYNES SALES.

The appointment of D. L. Watson as general sales manager of the Haynes Automobile Company, Kokomo, Ind., is announced by A. G. Seiberling, general manager. Mr. Watson has been with the company 14 years, starting as an apprentice in the shops and serving in every department. Just before his last promotion he was assistant sales manager. In his new position he succeeds R. Crawford.

The company has just closed the most prosperous season in its history and has declared a 22 per cent. cash and a 100 per cent. stock dividend.

COGHLAN FROM KLAXON TO MOON.

Raymond G. Coghlan, formerly eastern sales manager for the Lovell-McConnell Manufacturing Company, maker of the Klaxon horn, has resigned to become district sales manager for the Moon Motor Car Company of St. Louis, of which his brother, William J. Coghlan, is president. Mr. Coghlan is about as well known in the West as the East, having been in charge of the western territory for Klaxon for some time.

WESTINGHOUSE BONDS TAKEN.

The Westinghouse Electric and Manufacturing Company announced recently that stockholders had taken all but \$457,000 of the \$20,710,000 new convertible bonds offered to them.

The bonds not subscribed for are to be distributed pro rata among the depositing bondholders, who will receive cash for the balances of their deposited bonds at the rate of 105 and accrued interest.

MAXWELL TAKES OVER PLANT.

The Maxwell Motor Company, Detroit, has taken over the Newcastle, Ind., plant that has been operated for the past two years as an independent enterprise. This plant, under the name of the Maxwell-Newcastle Manufacturing Company, has been making parts for the Maxwell cars, as well as replacements for several of the older companies that were merged in the Maxwell organization. The growing demands of the parent company have made it imperative that the plant be used as a unit of the Maxwell company.

POPE WILL MAKE FINAL PAYMENTS.

Holders of the old Pope Manufacturing Company's \$1,000,000 worth of notes and paper will receive their final dividend in settlement in the near future. This payment is expected to amount to about 38 per cent., which makes the total amount realized by these holders in the neighborhood of 91 and 92 cents on the dollar. It was thought at one time that the total would not exceed 75 cents on the dollar, but the war operated to the benefit of the noteholders.

NEW COMPANY TO MAKE AUTOS.

The Sterling Automobile Company, a new concern, has leased 12,000 square feet of floor space in Paterson, N. J., for the manufacture and assembly of motor vehicles. The company is understood to have orders that will require several months to fill, and it is said that several nations at war in Europe have agents in negotiations for vehicles.

Edward J. and William Adelson, automobile dealers; Henry Hyman, fur manufacturer, and Charles Chambers, a lawyer, all of New York, are interested in the company.

BAMFORD GOES TO DETROITER.

W. R. Bamford, formerly associated with the Chalmers, Hupp and the Oldsmobile companies, has joined the Detroit Motor Car Company, Detroit, of which Alfred O. Dunk is president, as production manager. He has had wide experience along those lines.

HARTFORD AUTO PARTS MOVES.

The rumors of the removal of the plant of the Hartford Automobile Parts Company from Hartford, Conn., which have been current in the news for some weeks, has culminated in the announcement that the company will locate in neighboring New Britain.

Several civic organizations in Connecticut were bidding for the company. The New Britain Chamber of Commerce was responsible for the organization of a building company that will provide the necessary plans and erect a factory for the parts company, which will lease the property for five years and at the end of that time buy it.

The building will be 60 by 200 feet, two stories high and constructed so that two more can be added at comparatively low cost. It will have a

300-foot railroad frontage and 200 feet street frontage.

The company has grown rapidly and now employs 230 hands, with a weekly pay roll of about \$3500. It has been working 24 hours a day for some time, and recently added \$30,000 worth of new machinery to its equipment.

TO MAKE BULLET PROOF TIRES.

The Zeglen Tire & Fabric Company has been formed at South Bend, Ind., to manufacture tires from a "bullet proof" fabric, invented by Casimir Zeglen. The first use of this material was for coats. It is said that Archduke Ferdinand of Austria, whose assassination precipitated the European war, had on a vest of this fabric and that the assassin for that reason practised for weeks with his revolver in order to be able to shoot him in the head.

PACKARD DECLARES A DIVIDEND.

The Packard Motor Car Company, Detroit, has declared the regular quarterly dividend of $1\frac{3}{4}$ per cent. on the preferred stock, payable Sept. 15, to stock of record Sept. 1.

RESIGNS VICE PRESIDENCY.

Earnest R. Benson has resigned as vice president and a director of the Studebaker Corporation to become distributor of Studebaker cars for the State of Maine and a part of New Hampshire.

The reason given is that Mr. Benson has long been desirous of relocating in New England, where he formerly resided, and availed himself of the attractive opportunity presented in the northern section. He will make his headquarters at Portland, Me.

Mr. Benson's close affiliation with the Studebaker Corporation for the past few years, with the promising territory he has just assumed, assures for himself and Studebaker a great success.

A gain of 77.21 per cent. in sales of the Moon Motor Car Company, St. Louis, Mo., for August over those of August of last year is announced by President J. W. Moon.

The Hendee Manufacturing Company is reported as on the point of consummating an order for 10,000 motorcycles for one of the European nations.

HIGHLY EFFICIENT CHEMICAL ENGINE.

TO THE extensive line of motor propelled fire apparatus now being built in this country there has been added another chemical engine that is declared to have greater efficiency than any other apparatus now in use. It is the product of the Thomas Automatic Fire Engine Company and is standard in equipment and construction.

A Rumsey pumping engine and the Thomas automatic chemical charging apparatus are mounted on a standard White chassis. Bicarbonate of soda (plain baking soda) is the chemical used, and this is heated to 110 degrees or higher to liberate a large volume of carbonic acid gas.

The principle of action is that the gas chokes the supply of oxygen and quickly suppresses the flame, a principle that is old in practise and the basis of practically all chemical fire extinguishing apparatus. The Thomas company, however, has adapted a pump for the projection of the fluid, instead of by the use of acid, and utilizes a greater supply of carbonated water than has been possible heretofore. The gasoline pumping engine is driven by the truck motor.

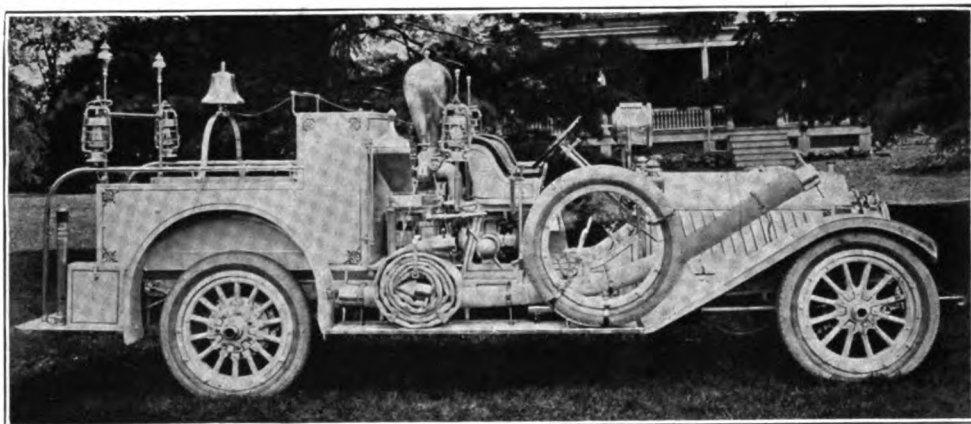
The soda is stored in a bin from which it is taken by a conveyor to a mixing chamber device, where it thoroughly impregnates every cubic inch of water with the soda in constant proportions. The capacity of the bin of the apparatus used on a 45-horsepower, four-cylinder White chassis, is 1000 pounds, which is sufficient to impregnate 8000 gallons of water. The capacity of the outfit mounted on the 60-horsepower, six-cylinder White chassis is 1500 pounds, which will provide 12,000 gallons of solution. The supply of soda can be replenished from a tender, or the engine can be used to pump clear water if desired.

In addition to the chemical mixer there is an ordinary chemical tank with acid receptacle for use at small fires or before the hose is attached

to the hydrant and the regular pump is operating.

TWENTY SPOTLIGHTS ON CAR.

At the opening of a fair recently in Fairfield, Conn., one car equipped with 20 Newtype spotlights, each furnishing 10,000 candlepower, was used to light the way for the parade and furnish light by which the musicians of the band could read their music. The lights were equipped with parabolic reflectors and the bulbs filled with Argon gas. The light supplied by the car totalled over 500,000 candlepower. The strength of the light can be judged by the statement that one of these Argon gas lamps operated by the Ford magneto will in half a minute set fire to a cigarette



The Thomas Automatic Fire Pumping Engine, Equipped to Charge a Limited or Unlimited Quantity of Water with Chemical.

held in the rays directly in front of the lamp. The lamps can be mounted on the windshield. The backs are equipped with mirrors for observing traffic behind the car either at night or day.

WANT TOLL GATES ABOLISHED.

An active campaign is being pushed by the citizens of York, Lancaster and Columbia counties in Pennsylvania to have the toll gates on the Lincoln highway within their borders abolished. The Public Utilities Commission, the State Highway Commission and the governor have been appealed to for aid. The state has appropriated \$250,000 for the purchase of the toll road and an effort will be made to have those on the Lincoln highway disposed of first.

NATIONAL WINDOW DISPLAY CONTEST.

PRIZES totalling \$15,000 have been distributed by the Rice Leaders of the World Association to dealers who contested for prizes in a nation-wide window display contest. The awards numbered 463 and they ranged from \$10 to \$2000.

The Willys-Overland Company and the Anderson Electric Company, maker of Detroit electrics, are the representatives of the automobile industry in the association. A number of their dealers were successful in winning prizes.

The following Overland dealers were honored: Davie-Levette Company, San Diego, Cal.; Memphis Overland Company, Memphis, Tenn.;

The displays on this and the following page won 12th and 13th prizes, respectively.

CONCRETE PAVING FOR THE COUNTRY.

The United States Department of Agriculture has issued a bulletin covering the subject of concrete pavement for country roads. Concrete paving, according to the bulletin, has increased from 364,000 square yards in 1909 to 19,200,000 square yards in 1914.

The qualities of the pavement which have led to its wide adoption are durability, smoothness, absence of dust and ease of cleaning, small cost of maintenance, availability as a base for another type of surface and attractive appearance.

The bulletin says the actual durability of the pavement has not yet been proven by experience, as there are no very old roads of this type, but from the condition of those that have seen several years of service there is a likelihood that concrete will wear well.

Disadvantages of the pavement are given as: Noise under horse traffic, wear at the necessary joints and a tendency to crack, which causes rapid depreciation, and the difficulty of repairs when these become necessary.

An attempt has been made to remedy these defects by placing a bituminous surface over the concrete, but this is not economically advisable in the opinion of the department experts. Formulas for the best concrete with tests for the proper materials are included in the bulletin. The engineering details of construction are fully discussed.

1500 MILES IN 14 DAYS BY ELECTRIC.

A Beardsley electric was recently driven more than 1500 miles in 14 days over roads in the vicinity of Los Angeles. Mrs. Volney Beardsley, wife of the president of the Beardsley company, was the driver for the first 10 days and was accompanied by a number of women representing the press and acting as observers. During the



Window Display by W. L. Huffman Company, That Was Awarded 12th Prize of \$250 in Rice Leaders of the World Association Contest.

the Atwood Automobile Company, Toledo, O.; Overland Louisville Company, Louisville, Ky.; Overland Syracuse Company, Syracuse, N. Y.; Bowman & Libby, Inc., Minneapolis, Minn.; Dye & Gardner, Monticello, Ind.; Huntsman, Hotchkiss Overland Company, Phoenix, Ariz.; C. F. Miller, Long Prairie, Minn., and the Overland Sioux City Company, Sioux City, Ia. The Detroit electric dealers who won were W. L. Huffman Company, Omaha, Neb., and the Electric Garage and Service Company, St. Louis, Mo.

The banner of the Rice Leaders of the World Association and a list of all the members of that organization were a part of each exhibit. Thirty thousand of these were used in dressing up the various windows that were entered in the contest. Awards were made after studies of photographs by leading authorities on window display.

last four days the car was in charge of owners of Beardsley electrics in Los Angeles. The average for the first 10 days was 106.6 miles, with the highest mileage for a single day, 117 miles. Each day's run was made on a single charge and the battery recharged at night for the next day's run. At the end of the test the battery plates were found to be in excellent condition.

ENVY SWISS INSURANCE COMPANIES.

American insurance companies carrying automobile insurance have been looking enviously toward the Swiss license system which requires that liability insurance be taken out with an approved company before an automobile license can be issued.

This is done on the same principle upon which the bonding of jitneys has been required, so that if any one is injured by the car suit to recover can be begun with assurance that payments will be made if judgment is secured. A corollary is that if an insurance company considers a driver a bad risk he must give up motoring.

The insurance companies find that while persons with ample financial strength to meet judgments that might be brought against them almost invariably carry insurance, those who could not meet a judgment usually have none.

Insurance officials are very much in favor of an agitation to secure the adoption of the Swiss system in this country, or at least a system modelled after the Swiss.

MAXWELL PRODUCTION INCREASED.

Shipment of the new 1916 model Maxwell from the Detroit factories has now reached 250 cars a day, which is a marked increase over last year's production. Cuyler Lee, who has been one of the largest dealers exclusively in high priced cars, has added the Maxwell line for distribution in the San Francisco territory.

WHITE TRUCKS GET GRAND PRIZE.

The grand prize for motor trucks has been given by the superior jury of awards of the

Panama-Pacific Exposition to the White Company, Cleveland, O. The decision of the jury was based on quality of materials, excellence of design, mechanical efficiency and low cost of operation. The volume of business represented by the exhibit was also a factor, as the White company is the largest manufacturer of commercial motor vehicles both in quantity and value of production.

MOTOR MAIL ROUTES IN DELAWARE.

The rural delivery mail service in the three counties of Delaware has been revised by Postmaster-General Burleson, who has ordered that mails there be delivered after Oct. 1 by motor. The routes average from 50.24 to 57.41 miles



Window Display by Davie-Levette Company That Was Awarded 13th Prize of \$250 in Rice Leaders of the World Association Contest.

each, and the carriers will be paid \$1800 a year instead of \$1200 a year, which was the highest rate when horses were used. The new system will save the government \$28,000 a year. It is said that great pressure has been brought to bear upon the postmaster-general to rescind his plan of motor delivery by congressmen who do not want their constituents thrown out of mail carrier jobs, but he is determined to carry it through.

If using a dual ignition system, be sure to switch from battery to magneto after the car is started, so as not to wear out the battery.

More than 60 per cent. of the discarded cars are worn out because of lack of proper lubrication.

NORWAY OUT OF TIRES.

Owing to the English ban against the shipment of tires to the Scandinavian countries, the supply in Norway is now entirely exhausted and not a tire is to be had anywhere in the country. The situation is more serious than it might otherwise be, owing to the fact that in lieu of railroads through the thinly settled rural districts, the country has developed motor trucking on a large scale for the marketing of products, and this service is threatened with paralysis. Many of the taxi cabs in Christiania have been forced to go out of business. The government is now negotiating with England for the privilege of importing tires from America on a guarantee that they will be held in the country and will not be shipped to Germany.

CONGRESS TO CONSIDER ROADS.

In the opinion of President John A. Wilson of the American Automobile Association, the question of federal aid for good roads will have to be met by the coming Congress through the growing pressure of the 2,000,000 automobile owners and of the farmers who are now in many places alive to the necessity of good roads.

Influential men have recently interested themselves in the good roads propaganda, both Speaker Champ Clark and Former Secretary of State William Jennings Bryan having made speeches in which they referred to the necessity of good roads improvement on a large scale.

FUNSTON WANTS WAR CARS.

Major-General Frederick Funston, commanding the Southern Department at Fort Sam Houston, Tex., has suggested to the War Department a plan for the extensive use of motor trucks and motor cars in the transportation of men and supplies for the United States army. He has recommended the purchase of four machines for use in rapid transportation between points where it is necessary to maintain controls.

WANTS ROAD WORK DONE IN FALL.

Work on the roads during the spring and summer is objected to by a member of the Automobile Club of America, who has written to the club journal, suggesting that an effort be made to have work done in the fall or early winter, when there is scarcely half the traffic over the

roads that there is in the spring and summer. Long rides over half-finished roads, detours over unimproved highways, and even through fields, are necessary now in many parts of the country during the summer, owing to the large amount of road work that is always under way.

JITNEYS ARE COMMON CARRIERS.

At the suggestion of Corporation Counsel Syme of the District of Columbia, jitneys operating in Washington have been declared common carriers and will be operated under the regulations of the commission. Mr. Syme's recent report on jitneys was very favorable to them and it is expected that the regulations will not be oppressive.

AUTOS KILL 36 IN NEW YORK.

The report of the National Highways Protective Association for August shows that 53 persons were killed in traffic accidents in New York City during the month. Automobiles caused the death of 36, of whom 18 were children under 16 years of age. Trolleys killed 11 and wagons six. In August, 1914, 29 were killed by autos, 11 by trolleys and 13 by wagons.

SOUTH AMERICAN EXPORTS INCREASE.

After having run along considerably below normal for several months after the war began, the exports of the United States to South America are now greatly increased. In the month of June three times the amount of automobiles were shipped to the southern continent than had gone in June a year ago. Since March exports have exceeded those of previous years.

AUTOS HAVE RIGHT OF WAY IN BRAZIL.

In Brazil there is no definite speed limit for automobiles and if a pedestrian gets in the way of one of them he has not only no redress for injuries he may receive, but he may be held responsible for injuries inflicted upon the machine.

Fog or rain will not obscure the vision through the windshield that is treated with a strong soapsuds made of good automobile soap and allowed to dry on.

Be considerate of your fellowmen and dim your head lights when necessary.

MOTOR STARTING AND CAR LIGHTING.

Armature Rotation Caused by Magnetic Influence—Electromotive and Counter-Electromotive Forces—Characteristics of Motor and Generator Design.

IN DIFFERENTIATING the generator and motor the residual magnetism of former is sufficient to excite the field windings and the pole pieces when the machine is started to generate current, and this current will in turn further energize the pole pieces and convert them into strong magnets. In the dynamo the lag of the current to a certain extent resists the rotation of the armature, but with the motor this influence becomes a magnetic drag that is the propulsive force. In the motor there is a residual magnetic influence and this is augmented by the current supplied to the windings of the pole magnets and the windings of the armature. In the motor the opposite poles of the armature are attracted by the magnetic influence of the pole pieces and the armature is caused to rotate. The magnetic drag of the motor turns the motor and constitutes the influence that the magnetic field exerts upon the armature wiring, through which the current of the line is flowing.

As the armature is caused to rotate between the poles the cutting of the lines of force creates or produces a counter electromotive force, which is increased with the speed of the motor. This results from the strengthening of the magnetic field and the large number of line of force created. But as the armature speed is increased there is lessened resistance to its action, and because of the greater counter electromotive force less energy is absorbed. As the load is placed upon the motor and the armature speed is retarded, the counter electromotive force is less and there is a corresponding increase in the energy absorbed.

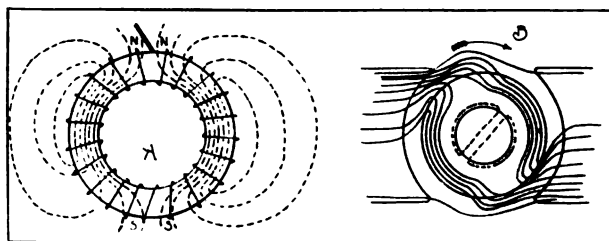
Value of Electromotive Force.

The electromotive force produced by a dynamo is proportionate to the number of turns of wire wound upon the armature and to the speed of rotation within certain limits. As the rotations of the armature produces a series of reactions between the windings and magnetic field, the armature is transformed to a magnet that is polarized at certain definite points in its rotation. These points of polarity are, according to the accepted law of induction, at right angles to the lines of force, and as the neutral points are the points of contact between the brushes and the commutator, where the current leaves and re-en-

ters the windings of the armature, the armature constitutes two separate magnets, with two north and two south poles, each pair of poles being an equal distance from the contact of the brush. The two north and two south poles really serve as single poles and at the extremities of the diameter of the armature cause the distortion of the lines of force with the rotation of the armature.

Collection of the Current.

The construction of the armature makes possible the collection of the currents induced at the windings at predetermined points. As has been stated, while the result from the magnetic induction of the armature windings is the production of an alternating current, there are points at which the induced current will always move in one direction, a condition due to the magnetic permanency of the magnetic influence. These



Movement of Lines of Force: A, Direction of Lines of Force and an Induced Current in the Polarisation of a Rotating Dynamo Armature of the Ring Type; B, Distortion of Lines of Force Passing Through the Rotating Dynamo Armature.

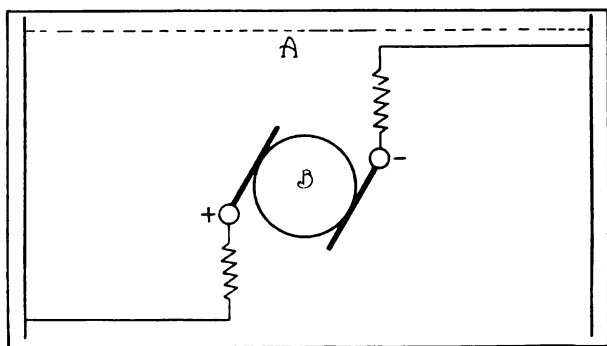
points are defined as the points of commutation, or neutral points, and these points are the location for the brushes which form the terminals of the outside circuit, that the current sent over that circuit may be perfectly constant. As the armature rotates the brushes bear upon the commutator at the exact neutral points, which neutral lines are at either extreme of the determined diameter of commutation, and in theory, at least, the diameter is at right angles to the magnetic lines of force, as estimated for a two-pole magnet. The angle, however, is varied slightly by the magnetic lag.

There is reason to have the channels for the windings of the armature as numerous as practical, and the series of segments of the commuta-

tor is governed by the character of the winding. The greater the number of the collecting members in the commutator, the less the fluctuation of the current, and the less the possibilities of arcing or sparking, but the segments must not be so numerous that brushes of sufficient diameter to carry the current will overlap and burn the commutator. The size of the commutator is as important as the number of segments that compose it.

The Propelling or Driving Force.

The induced polarities of the armature, the one resultant from the induction of the field and the other from the induction of the armature windings, cause the distortion of the magnetic field, and the current moves from the north poles of the armature windings through the armature to the south poles, and thence through the pole pieces of the magnetic field to the north poles of the armature, forming currents moving in oppo-



Principle of Counter-Electromotive Force: Assumed Difference in Potential Between Terminals 110 Volts; Assumed Counter-Electromotive Force 109.5 Volts; Effective Electromotive Force .5 Volts.

site directions at either side of the contacts of the brushes. The induced current in the armature moves at right angles to the direction of the inducing current in the windings. With the motor, however, the electromotive force moves in the armature in a direction opposite to the current. The current supplied to the circuit, influencing the windings of the armature, and the windings of the pole magnets, causes polarity in both, and the magnetic action is attraction of the opposite poles of the armature, which exerts a propelling or driving force.

Counter-Electromotive Force.

The counter-electromotive force moves through the armature in a direction opposite to the movement of the armature. This force is created within the armature in precisely the same manner and for the same reason that any other electromotive force is developed by conductors rotating in a magnetic field. Though the motor

armature will rotate from the reaction between the field of the magnets and the field of the conductors, the armature has exactly the same influence as free conductors revolving in a field, in that the lines of force are cut and electromotive force is produced. The counter-electromotive force can be accurately determined.

In illustrating this the action of a motor armature may be assumed. As current enters the motor the field magnets are energized and the current to a certain degree passes through the armature. The effect of rotating the armature creates an electromotive force within the armature conductors. But there are two electromotive forces within the armature, one of which sends a current through it, and the other opposes the effect of the entering electromotive force. The electromotive force energizing the armature is known as the line or impressed electromotive force, and the electromotive force generated within the conductors of the armature is known as the counter-electromotive force.

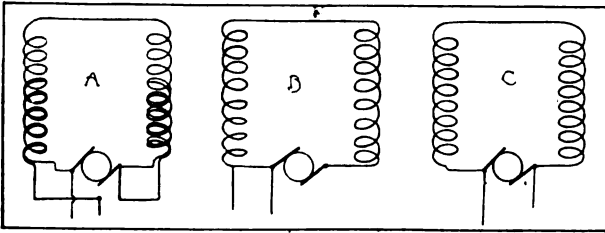
The electromotive force may be varied by conditions with reference to generation lines of force, and increase of the number of conductors of an armature will create an increased electromotive force. If the speed of a motor be changed there will be a corresponding change in the counter-electromotive force, while there will be similar change through the variance of the strength of the magnetic field.

Effective Electromotive Force.

The impressed electromotive force is the result of the current sent through the field magnets and causing a field of definite influence, and through the armature producing a rotative effect and power. When a motor is operated under load the greatest counter-electromotive force is developed, and because of this the current sent through the armature by the impressed electromotive force is at minimum. The difference between the impressed electromotive force and the counter-electromotive force is the effective electromotive force. The resistance of the armature governs the current that may be sent through it by the effective electromotive force. This may be illustrated by assuming that an armature has a resistance of .01 ohm, the impressed electromotive force is 110 volts and the counter-electromotive force is 109.5 volts. The difference between the two is .5 volts, and this would be determined as to current by $.5 \div .01 = 50$ amperes. This formula may be applied to any resistance and to any voltages, and the result will be the effective current.

With low resistance a very small effective

pressure will send a heavy pressure through an armature. In connection with this statement should be made that the changes of load will



Examples of Motor Wiring: A, Differential Wound, Constant Potential; B, Shunt Wound, Constant Potential; C, Series Wound, Constant Current.

vary the motor speed, and it will increase or decrease as the load is increased or decreased. With this variance there is corresponding change in the counter-electromotive force, and the current passing through the armature will vary. The effect of the counter-electromotive force is to automatically resist the speed when the motor is driven fast and its resistance is less when the motor is driven slow.

Classification of Motors.

Motors are classified by the character of the different windings and the form of current by which the machines are operated. Motors of the direct current type, and only this form is used by engine starting, are differentiated as the constant current series wound, constant potential shunt wound and constant current differentially wound. Of these three classes the motor that is used exclusively for starting the engine is a series wound type, these being the most practical for use with direct current circuits or sources which afford constant current and constant potential, such as may be supplied by a battery. Other types are built for other purposes.

A motor may be either a constant or a variable speed design, it being practical to vary the speed, and to control it, by using a resistance in series with the motor, which will govern the voltage and amperage it will receive. But when constant speed is required this may be best obtained by differential winding. The series wound motor will increase in speed as the load is reduced, and will reduce in speed as the load is increased, but the shunt wound motor will maintain a reasonably constant speed when the load is varied. The differentially wound motor may be defined as having a variable magnetic field, so that the strength is the greatest when the load is small, and the field is reduced in strength when the load is heavy.

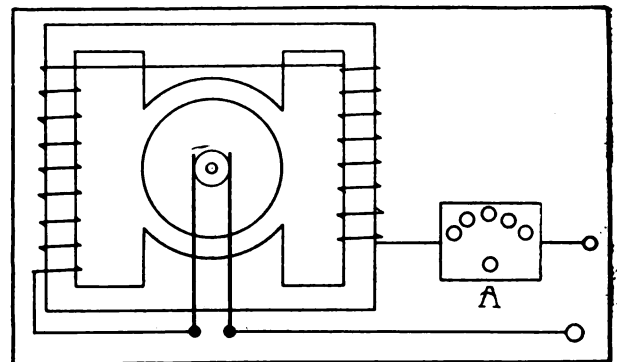
The design of these machines is extremely

important, and there are factors that have bearing on different qualities. For instance, the length and diameter of the armature windings may be varied, there being no recognized standard of these dimensions, but the high-speed motor armature is usually longer and smaller diameter than those built for moderate or comparatively slow speed. Varying the channels in which the windings are laid from exact parallelism with the shaft is to obtain minimum noise from operation, and the design of the channels is also with reference to reducing the formation of eddy current, which causes heating.

The series wound type is constructed with the two poles of the magnets wound with a small number of turns of a heavy low resistance wire, one end of which is connected to one brush and carries around both core poles to the outside line and to the other brush. With the shunt wound machines the pole cores are wound with many coils of a high resistance wire, and the field windings form a shunt circuit from the main outside circuit, the terminals of which are the brushes contacting with the armature. The compound wound dynamos combine the construction of the two previously mentioned, the field magnets being double wound, with a small number of turns of a heavy low resistance wire, which is arranged in circuit as in the series wound type, and with a second winding that is identical with that of the shunt wound machine.

Characteristics of Generators.

The generator differs from the motor in that the power is delivered by the commutator to the brushes and thence is carried to the terminals. If the current is put across the brushes, this current will flow from the positive brush through the outside circuit to the negative brush, into the



A Typical Drum Armature and Commutator, Showing the General Characteristics of Construction.

commutator, along the wiring of the armature and back to the positive brush. The high voltage of the generator is obtained by moving many

wires in series very rapidly across very strong magnets. Direct current generators are classified as to the source from which the field coils receive the electric current. The separately excited generators are built so that the field current is received from some outside source, such as storage cells, exciter generators, etc., and the self-excited types are designed so that the field current is drawn from the armature of the machine itself. As self-excited generators sometimes change their polarity when not in use, separately excited generators are generally used when the conditions of operations are such that the current should never change its direction.

Self-Excited Generators.

The self-excited generators are divided into three classes, the shunt, in which only a small part of the current delivered by the armature goes through the field, and the field current is said to be shunted around the main line current; the series generator, in which all the current delivered by the armature goes through the field before it goes out of the machine, and the compound, in which two coils are fitted to each pole. One of these coils, known as the shunt coil, takes a shunted current, and the other, known as the series coil, takes the series current. The compound type is the type that is most generally used.

In the shunt type, when the fields are shunted around the main circuit, many turns of fine copper wire are used in the construction. This design is intended to limit the current going through the coils, because all of this is drawn from the current available for the main circuit. The resistance of the coils is for this reason very high. The necessary number of ampere turns is obtained by a large number of turns which make up for the small current.

The Compound Generator.

One of the characteristics of the compound generator is that when any current flows from the machine into the line, the voltage falls slightly, and it continues to fall as more and more current is taken. To counteract this tendency of the voltage to fall as the load rises, the load current is led through another set of coils, known as the series coils, before it goes into the line. The more current the line takes the more current the series coils have, and the more strongly magnetized the fields become. This keeps the voltage the same, no matter what current (within the limits of the machine) is taken by the line. Such a generator is known as a flat-compound machine. Most of the magnetic lines in the field come from the current in the shunt coils, the

shunt coils having just enough ampere turns to increase this magnetism sufficiently to compensate for the tendency of the shunt generator to lower slightly in voltage as the load increases. Series generators are seldom used except in series arc lighting systems.

Between the main poles of most machines are smaller poles that are known as commutating poles, which are designed to prevent the brushes sparking on heavy loads or high speeds. The coils on the poles are always in series with the armature, so that their strength depends upon the armature current. Due chiefly to these poles motors are built that can be reversed at full speed and not spark at the brushes. The polarity of the commutating poles can be determined by first learning the polarity of the main poles, and following the direction of rotation of the armature any commutating pole will have the same polarity as the main pole following it, if the machine is a generator, and as the main pole behind it if the machine is a motor. The generator usually has the same number of sets of brushes as it has main poles, but since a machine has but two terminals connected with the brushes, all the positive brushes and all the negative brushes are joined in parallel and brought to the respective terminals.

(To Be Continued.)

COUNTS CARS AT CROSSINGS.

As a part of its safety campaign, the Long Island railroad, at the direction of General Manager J. A. McCrea, had the motor cars, which cross the company's tracks between 12 o'clock Saturday night and 12 o'clock Sunday night, counted.

At Merrick road crossing in Springfield 9408 automobiles crossed the tracks and at the Bar num Island crossing 4739 cars crossed. In the hour between 11 o'clock and noon on Sunday 845 cars passed the tracks at Merrick road. This is a rate of 14 cars a minute, or one every four seconds. A new type of gate for the crossings much heavier than the older style is being adopted.

THREE MEDALS FOR FORD COMPANY.

Highest honors in three departments have been granted to the Ford Motor Company for its exhibit at the San Francisco exposition. It received the gold medal of the Department of Transportation, the Grand Prize of the Department of Liberal Arts and the medal of honor of the Department of Social Economy.



FURTHER refined and improved, with a view of meeting every demand for those qualities that influence the careful and discriminating motorist, and which are potent factors in the minds of those who are experienced and know their service value, the Thomas B. Jeffery Company, Kenosha, Wis., has planned to produce in large numbers,—in fact the largest parts of its sales are expected to be this type,—a four-cylinder machine that is claimed to be superior to any ever sold for the price.

With a five-passenger touring body the car will sell for \$1000, and with two auxiliary seats that price will be \$1035. The 1915 price for this machine was \$1275, and the 1914 price was \$1550. The new price is a very substantial reduction, but the car is better than ever before because of the extremely careful refinement. Incidentally, the Chesterfield "Six," which was sold at the 1915 list price of \$1650, will be sold at the 1916 list for \$1350. No changes of consequence have been made in the Chesterfield.

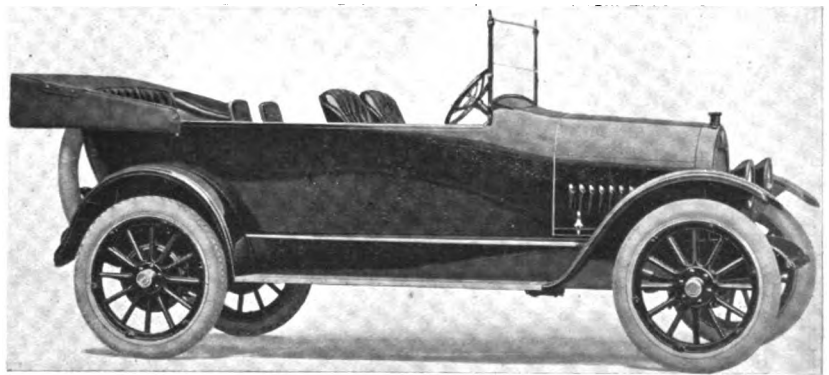
The cylinder bore and stroke of the motors in the four-cylinder cars is $3\frac{3}{4}$ by $5\frac{1}{4}$, the same as last year, but the power of the motor, especially on the hills, has been increased by a new design of crank shaft with different cams which changes the valve timing. Pushrods for the valves are now of a mushroom type instead of roller construction.

Increase in power has also been obtained by joining the inlet and exhaust manifolds for

part of their length so that the heat from the exhaust promotes carburetion, thus reducing the fuel consumption and affording maximum efficiency.

The carburetor, mounted on the right side of the motor, is a model K Stromberg. It is placed high and feeds through straight, smooth passages instead of former cored type. This increases the velocity of the gas. It is fed from a Carter fuel tank by gravity instead of pressure.

The Folberth pump, which was formerly driven from the water pump shaft, is now on top of the No. 4 cylinder. The Magneto which is driven from the pump shaft, is a Bosch. It is the only source of ignition. The radiator fan is a new two-blade aeroplane type made of aluminum, instead of the former pressed steel five blade construction. It is more efficient and lighter. The radiator is a new tubular type of eight gallons capacity, is 25 pounds lighter in weight and has a larger cooling surface.



Jeffery Four, Refined and More Powerful than Formerly—Price Now \$1000 for Five-Passenger Touring Body and \$1035 When Provided with Two Auxiliary Seats.

The upper half of the crank case is now cast iron instead of aluminum. The crank case cover is aluminum. The crankshaft is two inches diameter with the bearing lengths $3\frac{1}{4}$ inch front, $3\frac{1}{4}$ inch centre, and $4\frac{1}{2}$ inch rear, respectively.

Improved Auxiliary Systems.

The oiling system is a combination of forced feed and splash types in which a plunger pump feeds the main bearings directly and supplies the troughs under the connecting rod ends. The bearing of the idler gear in the timing case is also oiled by pressure.

The lighting and starting system is the two-unit Bijur, which replaces the flywheel type of motor starter. The new system includes a U. S. L. 6-80 battery instead of a 6-12 volt 100 ampere battery. This smaller battery is entirely efficient and lighter. The system of the 1915 chassis weighed 250 pounds and that now used weighs but 86 pounds.

The lighting generator is driven from the timing gears on the right side of the motor at one and a half times motor speed. It begins charging at a vehicle speed of eight miles an hour. The starting motor is at the left side of the engine and drives the fly wheel by a mechanically operated pinion. The reduction of ratio of cranking motor speed to the engine is 11.6 revolutions to 1. The engine can be operated at a higher number of revolutions a minute than that used in the 1915 chassis and has a larger power output. The claim is made that it will develop about 40 horsepower at 1900 revolutions a minute.

The clutch is a three plate dry disc type with one smooth steel plate and two plates faced with asbestos fabric. This construction replaces the cone used last year and a simple clutch

brake is included in the assembly. This is operated automatically and prevents the clutch from spinning after it has been disengaged and simplifies changing speeds.

The new three speed ratio gearset which replaces the four speed type of the 1915 chassis is lighter and is carried in a unit with the motor instead of in the centre of the frame. The gears are 5-8 inch face, of nickel steel, and the gear shifting is by a center lever in a ball joint.

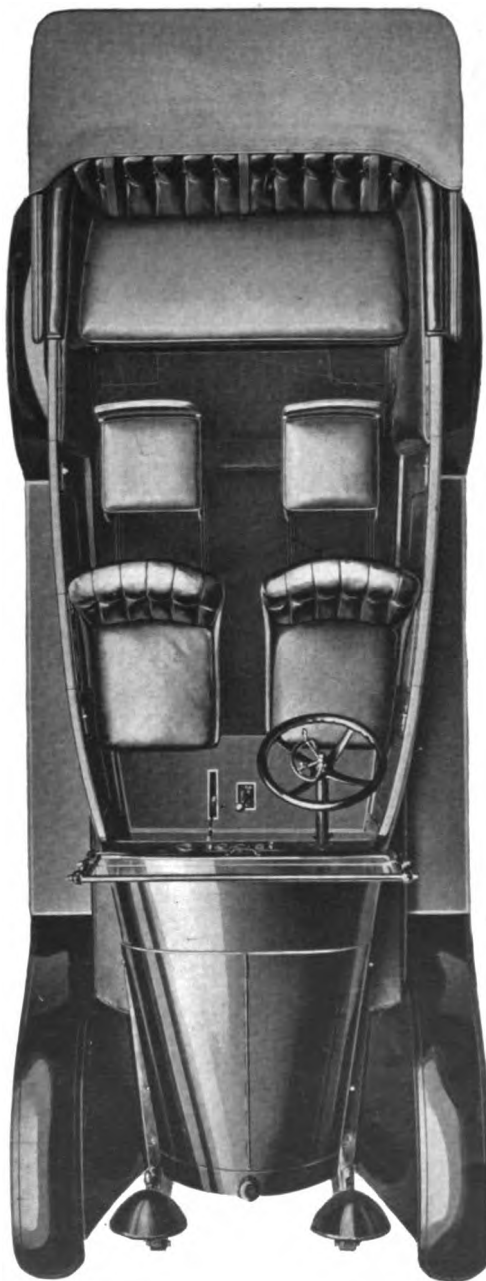
The emergency brake acts on the transmission system gearset and is controlled by the usual center lever. The drum is seven inches diameter and the fabric facing for the band is $2\frac{1}{2}$ inches wide.

The drive is by a hollow propeller shaft $1\frac{1}{2}$ inches diameter instead of a solid shaft $1\frac{3}{8}$ inches cross section. The rear axle is a semi floating type, with the driving shaft mounted on roller bearings. It is said to be 50 pounds lighter than the full floating, ball bearing equipped axle in the 1915 machine. The gears are spiral instead of straight bevel with motor to wheel ratios of 13.49 on first speed ratio, 7.55 in second, 4.15 in third and 17.97 in reverse. There is one set of brakes on this axle, which is used as the service brake.

Other Chassis Details.

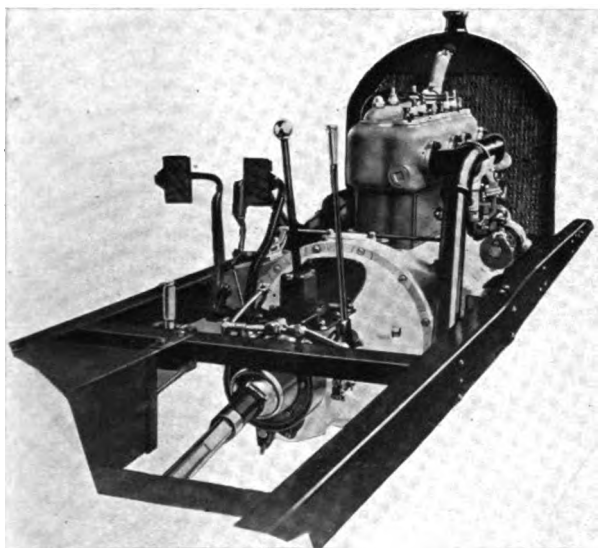
The drive from the rear axle is taken through the forward ends of the rear springs, which are 54 inches long. The shackle bolt diameter has been increased to one inch. The main spring leaves are alloy steel. A Warner-Munich steering post is located at the left side.

The new body has been designed which has ample room for seven passengers, but it is sold without the two auxiliary seats as a five-passenger machine. The



View. Showing Ample Seating Arrangements in the Jeffery Four—Capacity Seven Passengers.

design is a conservative stream-line type, which shows decidedly improved appearance where compared with former Jeffery models. The front



Unit Power Plant of the Jeffery Four, Showing Its Assembly in Chassis.

seats are separated.

A one man top is used instead of the former type of equipment. A Carter dash tank converts the gasoline feed from pressure to gravity. The tires are 34 by 4 inches and are mounted on Stanweld rims. There is a combination terminal board and fuse block in front of the cowl. A fuse may be easily replaced in a few minutes. Dash lights have been dispensed with, as the headlights are now fitted with Solar dimmers.

FINANCING SYNDICATE FOR DEALERS.

A syndicate is being formed in Boston by W. J. McDonald, a large real estate operator, to aid automobile dealers in financing their business. The plan is to erect a large warehouse in which automobiles will be stored and money loaned against them until they can be delivered to the dealer's customers.

A lot of 275,000 square feet has been secured and on this a building with 200,000 feet of storage space is to be erected, with provision for additions as they are needed. The building to begin with will be capable of storing 1000 cars. Spur tracks and loading platforms will be provided so that cars may be run right in from freight

trains and stored there. The warehouse will be fireproof and thoroughly modern. Money will be loaned upon them. The syndicate will have a capital of \$500,000. The plan will enable dealers to get along with less display and storage space at their places of business.

ELECTRIC SOCIABILITY RUN.

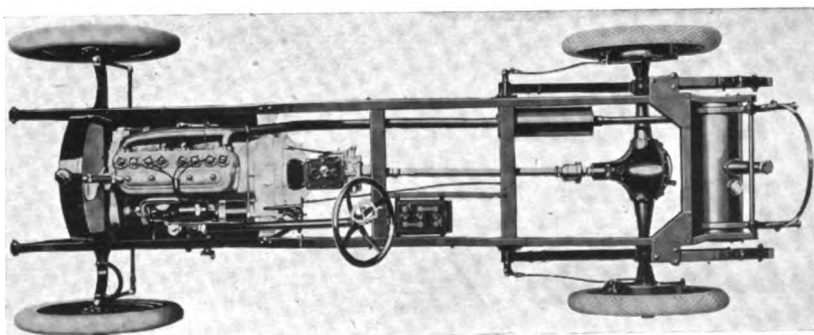
Sociability runs of electric cars will be held in many parts of the country during the week of Nov. 29 to Dec. 4, when all the electrical organizations in the country will carry out a co-operative campaign to demonstrate the widespread application of electricity to the needs of modern life.

Data regarding previous runs of the sort are being collected by the Electric Vehicle Association and an analysis of these, together with recommendations as to the details of the runs to be arranged, will be furnished organizations that may take up the work of promoting the runs.

These will be attractive and easy to women and prizes will probably be given on the basis of the average time for the distance. The routes are usually longer than those over which electric cars are ordinarily used and are useful in stimulating owners to extend the district over which they use their cars.

DURYEA TO BUILD \$300 CAR.

Charles E. Duryea, one of the first American automobile builders, and Henry Crowther of Philadelphia have joined forces to produce a new light car with unusual features of design to sell for \$300. A factory site has been secured at Greece, near Rochester, N. Y. The car is to have a four-cylinder, air cooled motor and friction disc drive. It will have 27 less parts than the ordinary automobile. It will be known as the Crowther car.



Chassis of the Jeffery Four in Which Are to Be Seen Relative Location of Components

JUDGING NOISE BY EAR.

Factory managers are often in difficulties with the experts of the final inspection force who test the cars for faults just before they are shipped, and who form many of their judgments on the amount and variety of noise given off by the chassis. Often the cars found to be unduly noisy by the inspectors sound quiet enough to the factory men. They dislike disorganizing their work and spending a lot of money tearing down and rebuilding a motor that they think sufficiently quiet.

The need of some more accurate standard than the human ear to judge such conditions has been keenly felt in most factories where careful work is done. Professor Curtain, of Canisus college, has evolved an instrument which records the amount of noise graphically and much more accurately than anything previously available.

Under his direction some tests were made recently at the Pierce-Arrow factory, which wholly discredit the expert tester's ear. Old and new cars, some of which had passed the final test and some of which had not, were placed near a phonograph and records made of the noises given off by their motors.

Testers were asked to listen to the records and classify the cars according to the noises they made. Every car was placed in at least three different classes by the different listeners, five were placed in four different classes, while two were placed in every class.

This seems to uphold the contention of factory managers on the unreliability of ear tests for noise, and proves the necessity of an instrument to take the place of the tester's ear.

PLEADS FOR CARE AT CROSSINGS.

A long statement has been issued by Fairfax Harrison, president of the Southern Railway Company, to the public, in which he pleads that in passing railway crossings at grade automobiles be stopped before reaching the tracks and that every care be used to prevent accident. He shows that in the states through which his road operates there were 69 grade crossing accidents in which automobiles figured, 12 persons were killed, 58 injured and 69 automobiles were demolished. He said that grade separations would eventually solve this problem, but that many years could pass before either the railroad or the public could afford to separate all the grades, and he urged that people talk caution at their

dinner tables and do everything possible to improve conditions.

ACCIDENTS INCREASE.

There were more automobile accidents in Massachusetts the first six months of this year than for the same period of 1914, the increase being about in proportion with the increase in registrations. Reports of the highway commission for the first six months show 109 people killed, 1973 injured and a total of 4175 accidents. In 1914 there were 82 people killed in the same months, 1339 injured and 3035 accidents. This shows an increase of 33 per cent. in deaths, 47 per cent in injured and 36 per cent in accidents. The registration increased 30 per cent. and the increase in the number of non-resident cars just about balances the result on a percentage basis.

EXPORTS STILL GROW IN VOLUME.

For the single week of Aug. 14, motor car and motor truck exports from the United States through the port of New York alone amounted to \$1,991,801. This was divided in \$672,262 worth of passenger automobiles and \$1,319,539 of trucks. For the same week last year, the total exports were \$182,524, all in passenger cars. These figures show that passenger cars, which for the first few months of the war ran considerably behind last year's figures, are now several times as great, while the export of trucks has reached entirely unprecedented proportions.

AUTOMOBILE SHOW FOR EXPOSITION.

The automobile display at the San Francisco Exposition is considered unsatisfactory because the cars shown there are 1915 models, which have already been superseded in many cases. An effort is being made to arrange a show of 1916 models in the transportation building for one week. San Francisco dealers demand that if the show is given motorists shall be allowed to drive their cars to the transportation building during the week and that the building be kept lighted and music be furnished during the show.

The Chilean Museo de Valparaiso has opened a travel information bureau where information and advertising matter concerning summer and winter resorts, fishing and hunting places will be filed for the benefit of Chileans who plan to visit foreign countries.

CAR ACCESSORIES AND EQUIPMENT.

"SU-DIG" MULTIPPOINT SPARK PLUGS.

A Special Plug for Connecting in Series with the Regular Plug to Secure Two Sparks at the Same Time.

The "Su-Dig" Spark Plug, shown in the accompanying illustration, is designed to operate in series with the regular motor plug, causing two sparks to occur in the same cylinder at different points. It is made by the Superior Specialty Company, 30 Irving place, New York City. This ignition system is claimed to consume the gas charge more rapidly, since the flame starting from two points has less distance to travel, so that the gas is completely consumed before the exhaust valve opens. This increases power and saves gas. Reliability of operation is said to be increased, because if one plug becomes sooted or grounded the other will continue firing, and in many cases will burn off the matter that has caused trouble for the other plug, and get it going again. Both sparking points of the plug are insulated and the top is fitted with two terminals, one of which leads to either sparking point. By connecting the wire from the coil or magneto to one terminal and running it from the other terminal to the regular plug, the current will be passed through the two plugs in series. Installation is simple in that all that is necessary is to drill and tap the exhaust valve cap. The price of the "Su Dig" is \$1.50, and it is made in all standard plug sizes and threads.



"Su-Dig" Spark Plug.

"SPEEDNUT" WRENCH DISPLAY BOARD.

This Fixture Enables the Prospect to Try the Wrench on Number of Nuts at the Show Case.

With every order for one dozen "Speednut" wrenches, the Cochran Pipe Wrench Company, 7800 Woodlawn avenue, Chicago, Ill., is furnishing the dealer an attractive



Display Board for Cochran "Speednut" Wrenches.

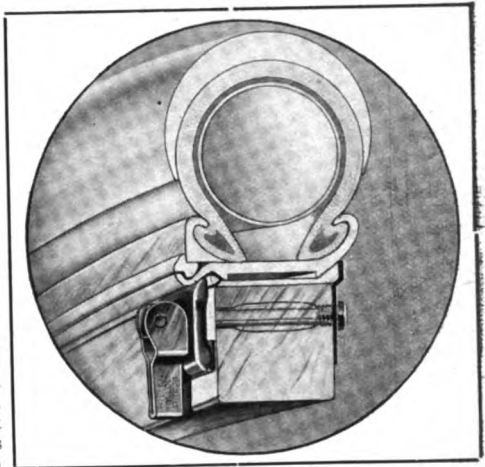
lowed to try for himself the automatic adjustment and ratcheting features of the Cochran "Speednut" wrench.

display stand. It is finished in mahogany and, as can be seen in the accompanying cut, has descriptive matter upon it and a picture of the wrench in four colors. At the base is a block containing a series of bolts, and to this a wrench is also attached. By this means the customer is al-

HIL-KO RIM LOCK.

Securely Locks Rim to Wheel, Saving Time and Making a Change of Tires Easier.

A device designed to hold the rim securely to the wheel while a change of tires is being made is marketed by the Hil-Ko Rim Lock Company, 2037 Railway Exchange building, St. Louis, Mo. It is an eccentric lever attached to the end of a standard sized bolt which replaces the present bolt and nut. When the lever is closed it is thrown off centre and being eccentric affords a positive lock. It cannot open unless released by a direct pull. It saves much time and makes for convenience when a tire must be changed, as it is necessary only to lift the lever and permit the lugs which retain the rim to fall down. It is installed by removing the usual bolts, inserting the Hil-Ko bolt and fastening a nut on the reverse side. The adjustment is constant and therefore rim squeaking is eliminated. The price of equipping a car with Hil-Ko locks ranges from \$10 to \$12.

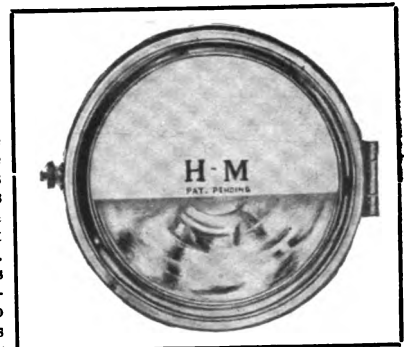


Hil-Ko Rim Lock.

H-M HEADLIGHT RAY CONTROLLER.

A Device Which Shades a Headlight, but Does Not Dim It Is Offered by Providence Company.

A ray controller which "shades the headlight, but does not dim it," is marketed by the H-M Manufacturing Company of Providence, R. I. It consists of a specially prepared glass which diffuses the powerful rays reflected from the upper part of the reflector and allows a strong beam to be thrown upon the roadway by the lower part. It is claimed that this does not reduce the amount of light produced and used, although it permits approaching pedestrians or drivers to look at the lights without being blinded. Installation can be made in 15 minutes and the only tool required is a screw driver. Flat glasses ranging in diameter from seven to 11 inches can be had at retail for \$1.50 per pair and curved glasses from eight to 11½ inches sell for \$3 per pair. A special Ford size is produced at \$1.50.

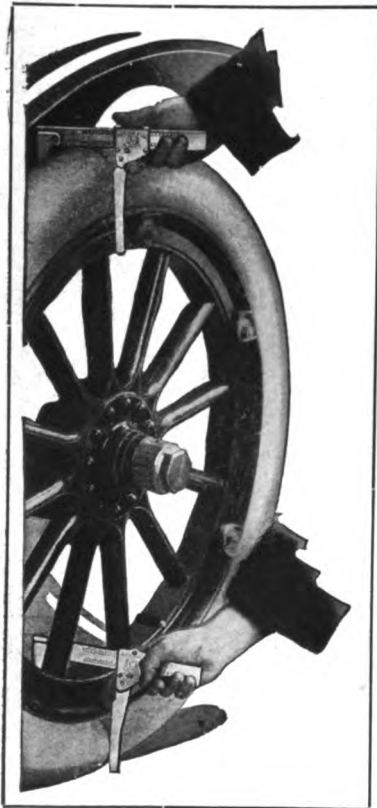


H-M Headlight Ray Controller.

B. F. GOODRICH TIRE CALIPER.

An Outside Gauge Produced by Great Rubber Goods Company Tells Accurately Air Pressure in Tires.

A tire caliper easily and simply applied to the outside is guaranteed by the B. F. Goodrich Rubber Company to tell accurately the air pressure in a tire. It is made of steel and nickel plated. It can be carried in the pocket of the operator or in the tool box, as it folds neatly into a leather holster. Its use is very simple. There are two graduated scales, one at the top and one at the bottom, the two being connected by slanting lines. The moveable arm is set at a point where the caliper will just fit over the tire at the top. The point of register on the upper or "size scale of tire" should be noted and the arm moved to the corresponding mark on the lower or "load scale on ground." The tire is now tested on the bottom, where the load rests on it. When properly inflated the arms should just slip over it. If it fits too freely the tire is too much inflated and air should be let out until the sides just touch the caliper. The retail price of this device is \$1, including the leather holster.



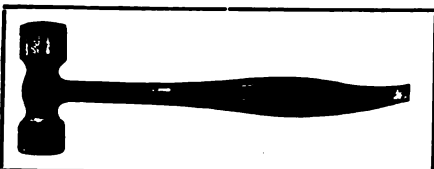
Goodrich Tire Caliper.

An advantage of this caliper is that the load condition is first taken into consideration and the tire inflated accordingly.

WILLIAMS' DEMOUNTABLE RIM TOOL.

A Device Which Is a Combined Socket Wrench, Hammer and Tire Iron.

J. H. Williams & Co., Brooklyn, N. Y., manufactures the demountable rim tool shown in the accompanying illustration, which has the advantage of combining a wrench, hammer and tire tool in one implement. It is drop forged from a strong, tough grade of specially selected steel. Each working part is tempered to best suit the use for which it is intended. The wrench is formed in the opposite boss from the hammer and is designed to fit the nuts retaining the rim on the wheel. This socket may be obtained to fit $\frac{5}{8}$, $\frac{11}{16}$ and $\frac{3}{4}$ -inch hexagon nuts. The hammer and the face of the wrench are brightly polished and the other parts are finished in black. The length over all is $9\frac{1}{2}$ inches, and the weight, one pound and six ounces. The retail price of the tool is \$1.



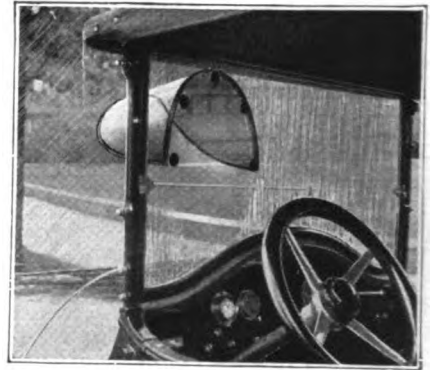
Williams' Demountable Rim Tool.

suit the use for which it is intended. The wrench is formed in the opposite boss from the hammer and is designed to fit the nuts retaining the rim on the wheel. This socket may be obtained to fit $\frac{5}{8}$, $\frac{11}{16}$ and $\frac{3}{4}$ -inch hexagon nuts. The hammer and the face of the wrench are brightly polished and the other parts are finished in black. The length over all is $9\frac{1}{2}$ inches, and the weight, one pound and six ounces. The retail price of the tool is \$1.

FREY "U-CAN-C" RAINSHIELD.

A Bonnet Shaped Device Which Keeps Rain and Snow from a Portion of the Windshield.

The "U-Can-C" rainshield, which attached to an ordinary windshield, is marketed by the Frey Manufacturing Company, 1514 Michigan avenue, Chicago, Ill. It is made of a flexible sheet of pyralin in the shape of a hood. Five vacuum cups hold it in any desired position at the front of the windshield so strongly that wind cannot blow it off. The cups can be easily detached by running a finger nail under the rim. A rubber strip is attached to the rear edge of the "U-Can-C" hood, keeping rain or snow off from the glass underneath. The front edge is bound in such a way that water will not drip off and blow onto the protected area of the glass. When not in use the device may be neatly rolled and placed in a substantial and compact tube, which may be carried in the tool box or under the seat. The retail price of the shield is \$1.50.



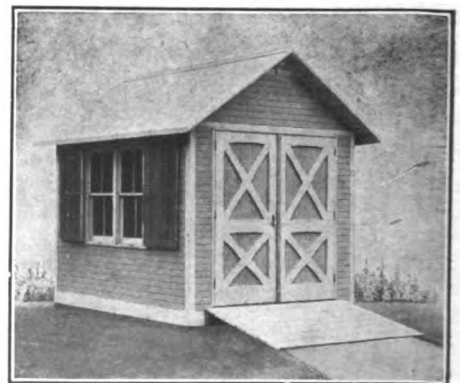
Frey "U-Can-C" Rainshield.

The front edge is bound in such a way that water will not drip off and blow onto the protected area of the glass. When not in use the device may be neatly rolled and placed in a substantial and compact tube, which may be carried in the tool box or under the seat. The retail price of the shield is \$1.50.

BOSSERT REDIBILT GARAGES.

A Portable Wood Garage with Air Spaces Between the Inner and Outer Walls Is Serviceable in All Weather.

A line of portable buildings for garage purposes that has more than ordinary interest for the car owner is produced by Louis Bossert & Sons, Grand street and Newtown Creek, Brooklyn. Because of its advantageous location and modern machinery this company is able to produce a very serviceable garage at a very low price. Material is accurately cut and fitted into sections before it leaves the shop. The sections fasten together by means of bolts, so that the only tool necessary for erection is a monkey wrench. Air spaces between the inner and outer walls tend to prevent the passage of either heat or cold through them and make the garage serviceable in either winter or summer weather. It may be taken down and erected any number of times without damaging it in any way. If it is desirable at any time to make it larger, new sections may be secured and added without remodelling. Prices and other information will be given by the maker. Please mention The Automobile Journal.



Bossert Redibilt Garage.

PROGRESSIVE CARBON REMOVER.

A Practical Carbon Removing Apparatus Which Generates Gas at Low Pressure.

The oxygen method of removing carbon is preferred by many motorists because it permits the burning of every particle of carbon without taking down the motor. The Progressive Manufacturing Company, Reading, Penn., is marketing a practical device for doing this kind of work, which retails at a very moderate price. The cost of operation is slight, as it always generates its own gas and at low pressure, so there is little danger of doing damage to the piston or cylinders. The charge used in the device weighs three pounds and this is sufficient to thoroughly clean a four-cylinder engine of the ordinary size. All parts of the apparatus liable to damage are made of malleable iron. The retort in which the charge is heated is made of seamless pressed steel. The outfit retails complete with one charge at \$7.50. Extra charges may be obtained at \$4 per half dozen, or \$7.50 per dozen.



Progress Carbon Remover.

"BURD" PISTON RINGS.

Metal Guard Fits Opening of Piston Rings and Makes It Compression Tight, Insuring Exceptional Efficiency.

The Burd High Compression Ring Company, Rockford, Ill., is manufacturing piston rings for which the claim is made that they cannot leak compression. The design of the ring is similar to that of the common type, except at the opening. This is closed by a metallic guard. The ring ends are formed to support the guard and also to retain it on the under side so that the guard bears lightly against the cylinder wall. There is a slight relaxation of pressure on the cylinder wall when the motor is cool, and this makes cranking easier. Claim is also made that oil cannot work past the rings and into the combustion chamber. All Burd rings are guaranteed to be free from defects in material or workmanship and against flaws and breakage. To further assure the purchaser that the company has full confidence in the high compression rings, it will warrant every motor in which a full set of Burd rings is installed, to produce a higher compression and give more power, using less fuel and oil than with any other piston ring made. After a test of 30 days actual service, if the rings fail to substantiate the war-

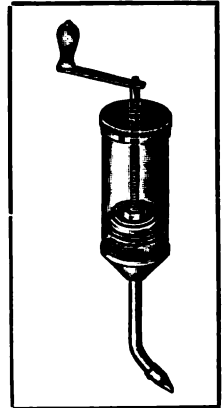


ranty, they may be returned and the full purchase price will be refunded. This warranty only applies, however, to cars which are in good condition. The rings retail according to size from \$1 to \$2.25.

HAYES GREASE GUN.

A Mechanically Operated Device to Which Great Saving of Time and Labor is Credited.

The Hayes Grease Gun Company, 229 Mulberry street, Newark, N. J., is manufacturing a grease gun with a brass retainer $6\frac{1}{2}$ inches in length and three inches in diameter. A flexible plunger is forced down by a $\frac{3}{8}$ of an inch multiple threaded screw which has a No. 6 pitch. The advantage sought by this type of plunger is that if the barrel of the gun should become indented as much as a quarter of an inch the felt insert will pass over, and the usefulness of the device will not be impaired. The end of the apparatus is cone shaped, so as to prevent back pressure and to keep grease from working back over the plunger. Cone shaped attachments are also furnished, which fasten to the end of the lead tube, so the grease may be easily applied to timing gears and universal joints. As is shown in the accompanying illustration the operation is made easy by a handle which is fitted to the screw. The price is \$2.50 and it is sold with a guarantee that if satisfaction is not given it may be returned inside of 10 days and the price will be refunded.



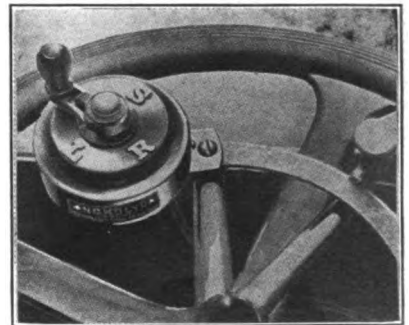
Hayes Grease Gun.

THE NOKOLYD SIGNAL.

An Electrically Controlled Equipment That Will Warn Rear Drivers of Movement of a Car.

Accidents happen daily from an overtaking car striking another because the driver of the rear machine has no knowledge or understanding of the intentions of the driver of the leading automobile. Many cities have ordinances requiring drivers of vehicles to extend their arms as signals when about to stop or turn. This signal is generally recognized and while it has served to minimize accidents, it is not certain and is not always given in time. All cars do not drive from the same side and many times the signal is not seen.

The Nokolyd Signal Company, 40 West 13th street, New York City, sells a device that if installed on all cars will practically obviate all probability of such accidents. This equipment is a signal that can be conspicuously placed on the back of the car. It is electrically controlled by a device conveniently located for the driver. Should he wish to stop the handle in front is placed on "S" and the signal in the rear will show the sign "STOP." When about to make turns, by placing the handle on "L" or "R," the signal will show "LEFT" or "RIGHT." When no signal is needed the lever is placed on "O." The sign is illuminated by the current from an ignition or lighting battery which is automatically switched on when the signal is set. This signal retails for \$60 and is warranted against defects for one year.



Nokolyd Signal Control.

RARE BARGAIN IN RAINCOATS.

Combination Outfit Shown Is Offered at \$3.75, a Special Price to Car Owners.

The manufacturers of the raincoat, cap and goggle combination illustrated, the Norman Garment Company, 32 Union square, New York City, is offering the complete outfit to motorists for the special low price of \$3.75.



Norman Garment Outfit for the Motorist.

The outfit is especially adapted to motorists, and embraces several distinctive features. One of these is that the cap and goggles are in one unit, the latter being folded within the cap when not in use. When in that position they do not interfere with the snug fit of the cap.

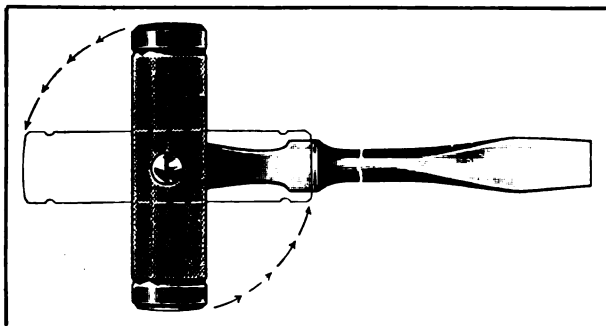
The cap and the coat, the collar of which will button closely up to the chin and afford complete protection from cold, rain and wind, are made of the best quality

tan covert material, which is water proof and will not show dust stains. The outfits are made for both men and women. The special price is made with the provision that the name of the nearest dealer and the price of the outfit accompany the order. When writing, the inquirer should mention The Automobile Journal.

CRESCENT HAMR-HANDLE SCREW DRIVER.

May Be Used as Ordinary Screw Driver or Handle Folded to Obtain Increased Leverage.

A tool combining the features of a light hammer and a screw driver has recently been placed on the market by the Crescent Tool Company, Jamestown, N. Y. This is called the Crescent Hamr-Handle Screw Driver, and when used as a screw driver greatly increased leverage may be secured by means of the folding T handle. One end of the handle is solid and may be used as a light hammer for starting the screws. For common purposes the tool is used as an ordinary screw driver, the tool being held in an upright position by a strong spring. The spring also maintains the horizontal position when the handle is placed that way. In the illustration the handle



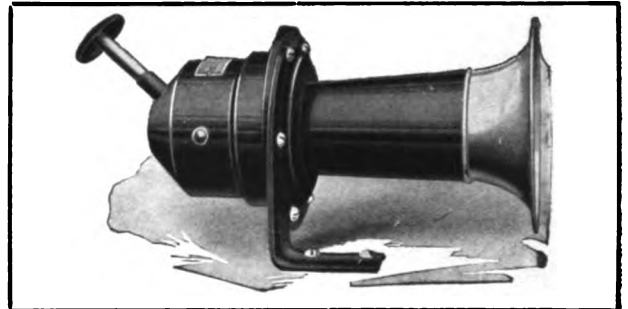
Crescent Hamr-Handle Screw Driver.

is shown in the horizontal position, the arrows showing the operations necessary to place it in an upright position. The knurled surface insures a perfect grip. The tool is guaranteed to give satisfaction.

GARFORD HAND WARNING SIGNAL.

Plunger Set at 45-Degree Angle Operates Hand Horn That Can Be Heard Above Traffic Noises.

By the adoption of efficient production methods applied to a large output, the Garford Manufacturing Company, Elyria, O., is able to sell the Garford hand warning signal illustrated herewith at \$3.85. It is an accurately built instrument in which only the best materials are employed. The signal is operated by pressing down the plunger, which for the convenience of the operator is set at a 45-degree angle. A bracket is supplied for mounting and will not break or work loose as a result of con-



Garford Hand Warning Signal.

tinuous operation or abuse. By reason of the care taken in assembling the parts to insure close fitting, it is impossible for dirt or other foreign matter to reach the interior of the mechanism. The instrument is finished in black and nickel, black and brass, or all black.

BENJAMIN REPAIR SPECIALTIES.

Equipment for Roadside Repairs and a Portable Lamp for Use Around Inflammable Gases.

The Benjamin Electrical Manufacturing Company, 120 South Sangamon street, Chicago, Ill., are manufacturing a friction drive tool set and the Benjamin vapor proof

lamp. The auto tool set shown in the illustration is listed as No. 7 and consists of the tools that are most needed in emergencies, four screw driver blades, one three-sided angle screw driver blade, a gimlet, a spark plug scraper, a tapered reamer, a bradawl, a friction drive handle that can be used interchangeably with all of these tools, and a



Benjamin Equipment for Roadside Repairs.

double-ended alligator wrench. The complete set is neatly arranged in a khaki case. The set is designed for motorcyclists as well as motorists.

The Benjamin vapor proof hand portable lamp is designed to be used with entire safety in any part of the garage. The chief parts of the lamp are a strong wooden handle, porcelain screw base receptacle with lamp grip, metal guard with hinged hook and a vapor proof globe with an aluminum reflector. A 25-watt tubular lamp is used, but is not furnished. Complete details will be furnished on request. Please mention The Automobile Journal.

PRACTICAL MOTOR CAR REPAIRS.

A COMMON method of determining play in main bearings of an engine is to grasp connecting rods or shaft with the hand or pry them

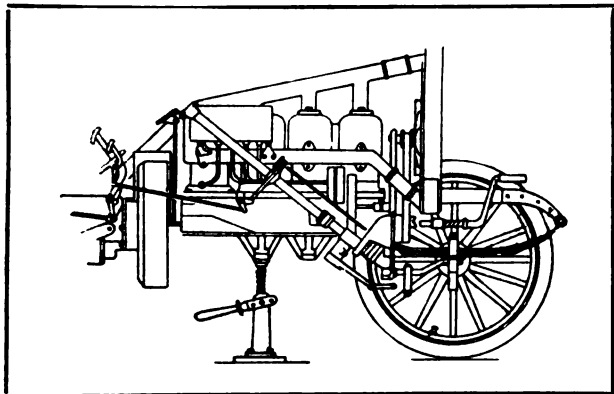


Fig. 80—Determining Play in Main and Connecting Rod Bearings by Jacking the Crankshaft.

with a bar. While this test may be made with more or less success, a better and more accurate adjustment may be effected if the operation be done as shown in Fig. 80. Remove the lower half of the crank case and place the pistons on dead centre. The jack head can now be placed under the lower half of a connecting rod bearing and any play either in the rods or main bearings may be easily learned as the jack is raised and lowered. It may be advisable after raising the shaft to try to insert thin shims between the lower part of the bearing and the shaft.

HOME MADE JACK.

The automobile jack illustrated in Fig. 81 D-E, can be easily made from spare pipe fittings to be found in almost any shop. To a piece of one-inch pipe, about 10 inches in length, screw on a flange, D, to serve as a base. Within the pipe, H, insert a $\frac{1}{2}$ -inch pipe, I, that is 12 inches long. This should be threaded for its entire length and a cap fitted to the lower end. A bar of iron, J, 15 inches in length, one-quarter inch thick, and $1\frac{1}{4}$ inches in width is shaped as shown, and a hole sufficiently large to admit the pipe I is drilled at the end. Cut a number of slots in periphery

of a small flange, as shown at K. The centre of the flange should be bored and threaded to fit the pipe I. The flange is then screwed down on the pipe, I, until it rests on the pipe H. The bar J then fits over the flange and a hook attachment, which is secured to the end of the bar, insures its relation with the flange. A pawl, L, is then made from $\frac{1}{2} \times \frac{1}{4}$ -inch steel stock about eight inches long. This is secured to the centre of the bar J by a machine screw. At the top of the pipe I, a jack head is made by sawing a pipe tee in two. The action of the jack is obvious, as it is possible to swing the pawl on its axis to engage the notches in the flange at either side of the bar J.

HOW TO REMOVE DENT FROM HORN.

Of the several methods for removing a dent from an automobile horn, the following simple suggestion is made. Make a loop in a strong brass wire, and bend the loop at right angles. Solder it to the dented part of the horn, as shown at Fig. 81 A. When the solder has set, place the other end of the wire in a vise and by giving a few firm jerks to the horn the depressed part will be pulled up. The wire can be removed by melting the solder.

PREVENTING HOSE FROM KINKING.

If the greatest of care is not taken when fitting rubber hose between the radiator and the cylinders, there is danger of it kinking at the point of bend. A simple remedy that will positively prevent this is shown at Fig. 81 B. From

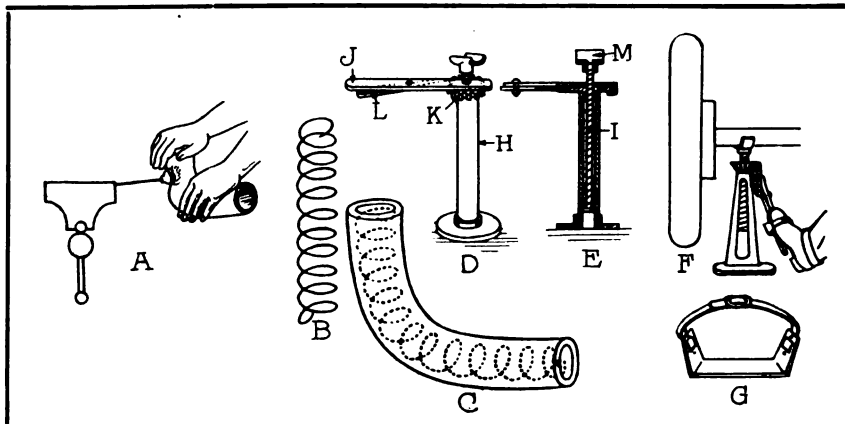


Fig. 81—A, Removing Dent from Horn; B-C, Preventing Hose from Kinking; D-E, Home Made Jack; F-G, Foot Attachment for Jack.

a length of 3/32-inch brass wire, wind a spiral spring, making about three windings to the inch. The diameter of the spring should be such that it

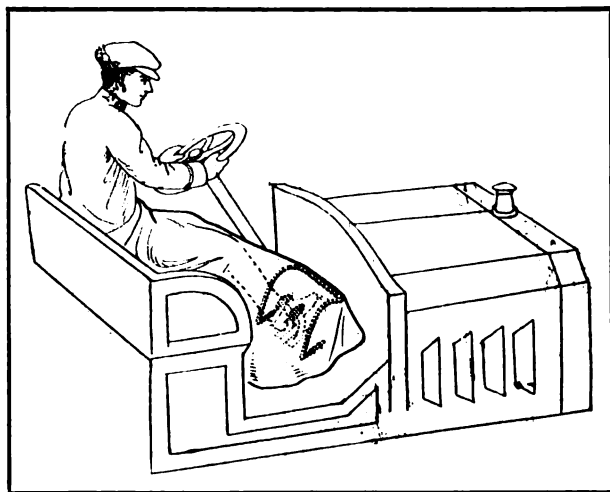


Fig. 82—Easily Constructed Truck Drivers Robe Guard.

will snugly fit the inside of the hose. The ends of the spring should then be bent inwards to prevent them from puncturing the rubber. Fig. 81 C illustrates the assembled device.

FOOT ATTACHMENT FOR JACK.

Raising heavy cars with the ordinary hand operated jack is a strenuous operation that is avoided when possible by the driver. A much easier method of operating a jack for such work is shown in Fig. 81 F-G. A foot stirrup is riveted to the jack handle. This can be made by shaping a piece of sheet steel, shown at G, and cutting two slots at the ends so as to admit a strap. This can be adjusted to fit the foot snugly by tightening or loosening the strap as desired. It is obvious that this fitting will afford greater leverage than can be obtained with the hand, and it is a convenience that can be appreciated by every man who handles a jack.

EASILY CONSTRUCTED ROBE GUARD.

Many large trucks are not so equipped that the driver is protected from rain. This condition necessitates the use of water proof robes that are placed over the knees. Fig. 82 illustrates an easily constructed device which prevents a robe when used with such a truck from touching the foot pedals. It consists of a piece of metal rod a quarter inch in diameter and bent as shown. This permits the foot to pass through the guard, but prevents the robe from being drawn in with the pedal.

ENCLOSING VALVES.

An easy and inexpensive method of enclosing exposed valve parts on a gasoline engine is illustrated in Fig. 83 B. Obtain an ordinary cardboard mailing tube which is slightly larger in diameter than the valve spring. Measure the height of the parts to be enclosed and then cut the tube accordingly. With a sharp knife cut a slit from end to end. If care is taken the tube may be spread sufficiently to pass around the parts. When in position it may be painted to any desired color. Besides keeping the parts clean, the shield will greatly reduce the noise of the tappets.

REMOVING DENTS FROM RADIATORS.

The removal of dents from the surface of a radiator is not an easy task even for the expert. A method frequently used with much success is as follows: Remove the radiator from the chassis and solder small pieces of tin over all the openings, such as water connections, overflow pipe, etc. At the filler opening of the radiator provision must be made for attaching a pump. This connection is easily made by taking an old valve stem and soldering it to the centre of a piece of tin as shown in Fig. 83 A. After it has been ascertained that all openings have been closed, the radiator should be subject to air pressure. A small, smooth block should then be placed at the edge of the dent and lightly struck with a hammer. Repeat the operation entirely around the dent and the air pressure will gradually force out the uneven part. Of course judgment should be shown as to the amount of air pressure required. Another good method is to plug all the openings except the filler opening

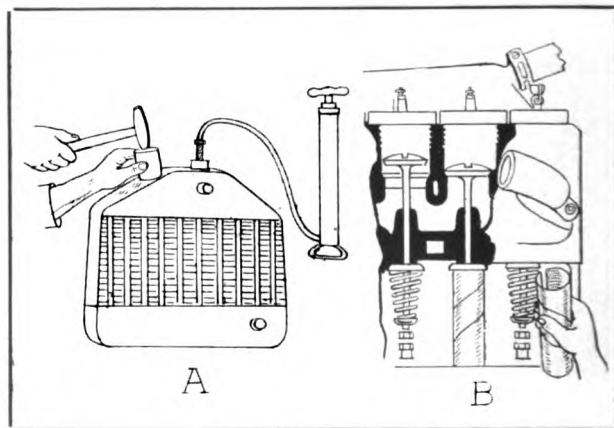


Fig. 83—A, Removing Dents from Radiator with Air or Water Pressure; B, Inexpensive Silencing Noisy Valve Stems and Tappets.

and then fill the radiator with water. A tight fitting cork should then be driven into the opening, the result being that the water is subject to

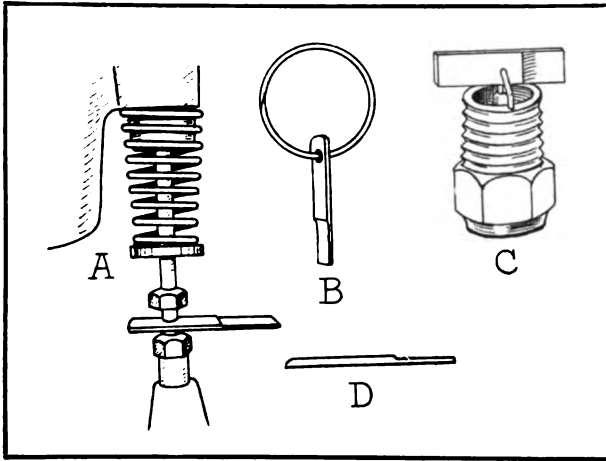


Fig. 84—Handy Gauge Made from Old Hack Saw.

slight pressure. Proceed as above to remove the dent, the water furnishing the means for pressing out the dented section.

GAUGE MADE FROM HACK SAW BLADE.

Many handy tools can be made from broken or discarded parts. An old file can be easily shaped into a cylinder scraper, bearing scraper, screw driver or cotter pin extractor. A broken hack saw blade can easily be made into a handy gauge, as shown in Fig. 84. The usual thickness of a hack saw blade is about .03125 inches. This is the exact distance that should be allowed between the tappet and the valve stem, as shown at A, and also the usual distance to be allowed between the points of the spark plugs, as at C. If the car is equipped with a magneto, one end of the blade can be ground down to the correct thickness to serve as a gauge, D, for the setting of the magneto breaker points. The saw teeth can be ground off on a smooth emery wheel. For the convenience of carrying on a key ring, one end of the blade can be annealed and a small hole drilled, as at B.

BENDING COPPER TUBING.

It often happens that when fitting a new carburetor to a machine it is necessary to bend the gasoline line running from the tank. This line is usually made of copper, and if the greatest care is not taken, the pipe will kink at the place of bend, thus greatly constricting the internal diameter of the tube. Very often tubes measuring up to $\frac{3}{8}$ inches in diameter can be bent with

safety, but for larger ones they should be filled with sand, rosin or lead. For smaller tubings, the place to be bent should be brought to a red heat and the bend made a little at a time around a round bar held in a vise, as shown in Fig. 85 A. If the tubing is hard drawn it can be easily annealed by heating until red hot and then suddenly plunging it into a water bath.

SIMPLE TERMINAL.

A practical and easily detachable terminal for a secondary wire can be made from a small piece of copper tubing which has a bore of about the same size as the outside diameter of the cable. Remove all insulation for about an inch from the end of the cable as in Fig. 85 B. Place the tube over the cable, as at C, and after spreading the strands, flatten the end of the tube, as shown at D, with a hammer. The corners can now be filed round and a small hole drilled in the centre of the flattened part, as at E. The terminal can be made of the quick detachable type by sawing a slot at the side and into the hole as shown at F. A terminal of this type is practically indestructible.

ELECTRO MAGNET.

It often happens that a screw, nut or stray piece of metal will be dropped into some inaccessible part of the engine. Considerable time can be saved in recovering it if an electro-magnet, shown at Fig. 86, be kept handy. A suitable length of 3/16-inch steel rod forms the basis of the device. A small switch is attached near the end of the rod. This consists of a sliding piece of sheet metal insulated from the rod by a fibre block. Its construction, shown at Fig. 86 A, requires no explanation. At the lower end

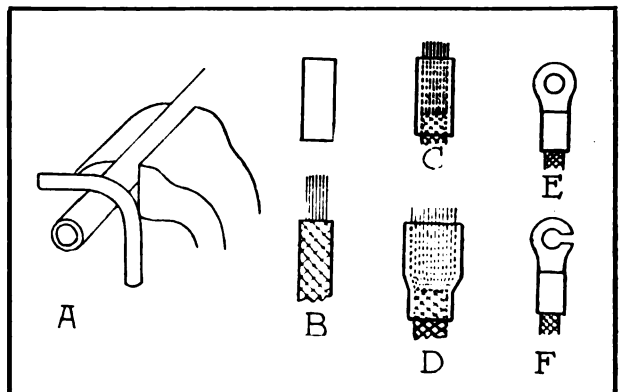


Fig. 85—A, Bending Copper Tubing; B-C-D-E-F, Progressive Steps in Making a Practical Terminal.

of the rod bind several layers of soft iron wire, running it lengthwise on the rod to serve as a core. Around this core wind several layers of

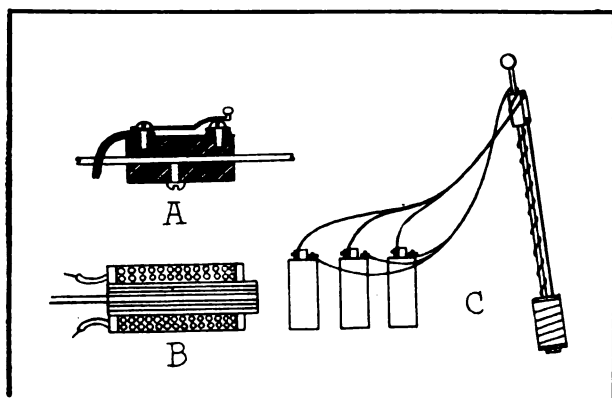


Fig. 86—How to Make a Handy Electro-Magnet.

No. 16, or 18B and S gauge, silk insulated magnet wire. A coat of shellac is applied to the surface and covered with a layer of insulating tape, as shown at B. The wires leading from the magnet coil should be left long so that one end may be bound to the switch and the other carried alongside. The best results can be obtained by connecting three or four cells in parallel and wiring to the magnet, as shown at Fig. 86 C. When the current is switched on, the magnet attracts any stray metal piece. It should be remembered that if the part lost is made of copper or brass, the magnet will have no attraction for it.

SOLDERING A WATER JACKET.

If the pressure to be withstood is not too great a crack in a cylinder water jacket may be repaired by soldering. Some copper sulphate or blue stone is dissolved in water and the sides of the crack are painted with it several times until a coating of copper begins to appear. This surface will retain solder and usually that will make a very satisfactory repair.

A WIDE DOOR FOR A SMALL GARAGE.

Circumstances will sometimes require the mounting of a large door of a small garage on rollers, but should width of the building not permit a track of sufficient length, the situation can be met by the use of two doors hinged together. One door is fitted with rollers at the top which run on a track, as shown in Fig. 87. If the hinged door is very heavy, a small weight should

be attached to the lower left corner of the door mounted on rollers to serve as a counterweight. It is a good policy, however, to have the door on rollers the heavier of the two, so that no weight will be necessary. It is obvious that when the hinged door is folded back the two may be pushed back on the track as a unit, thus allowing a full door space.

CEMENT FOR BRASS ON WOOD.

A good adhesive for attaching a piece of brass or iron to wood can be made as follows: To every pound of wood-workers' glue in the dry state add one fluid ounce of glycerine and one ounce of slacked lime. The glue should be boiled in the usual manner, and the glycerine and lime added and stirred in well. To this mixture, two thimblefuls of hard boiled linseed oil should be added for every pound of dry glue. Stir thoroughly. The mixture can be thinned with linseed oil.

The brass part should be dipped in a solution of one part nitric acid to 10 parts water. This will roughen the surface of the metal and afford a purchase for the glue. Both the metal and the wood should be warmed before applying the mixtures. They should be placed in a clamp until thoroughly dry.

CEMENT FOR BATTERY JARS.

A cement adapted to battery jars, made from fibre or similar material, and which is not effected by acid, is made as follows: Mix two parts of powdered asbestos, one part of ground baryta and two parts of sodium water glass solution. This cement will also unite metal.

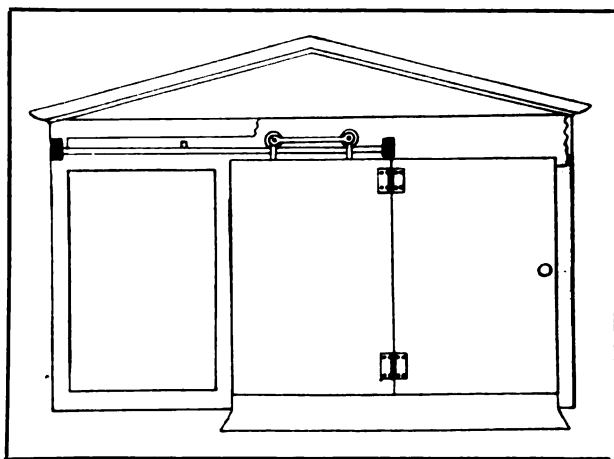
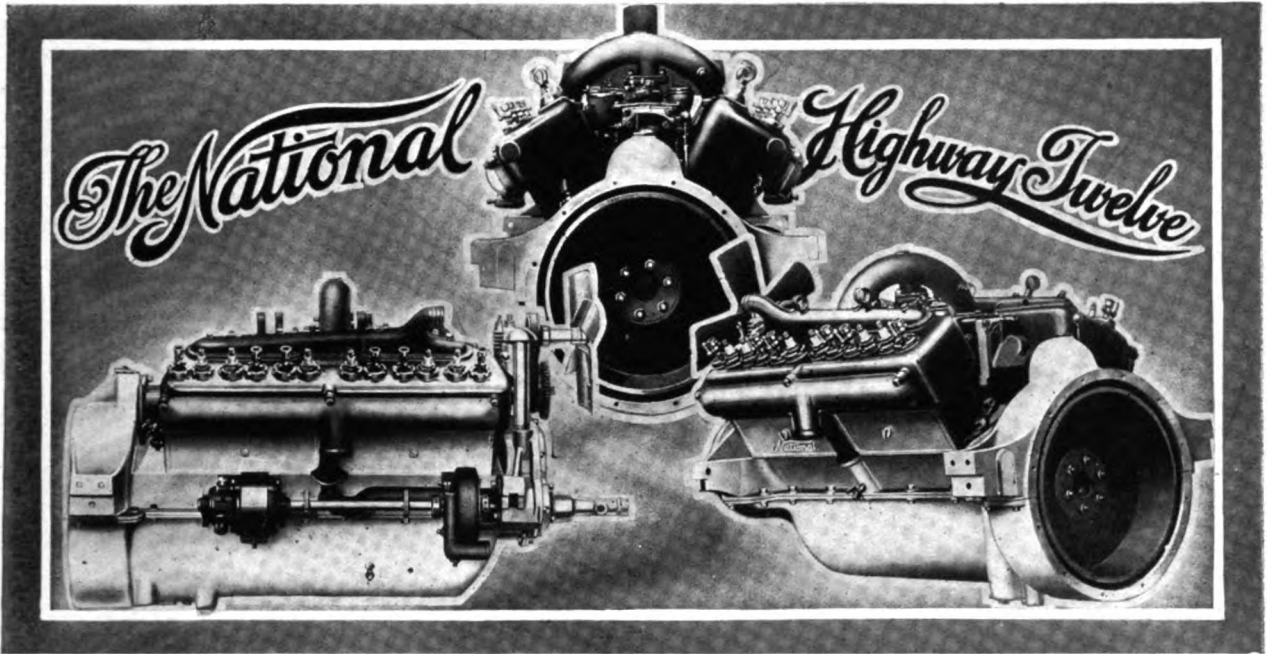


Fig. 87—Combination of Rolling and Swinging Door for Small Garage.



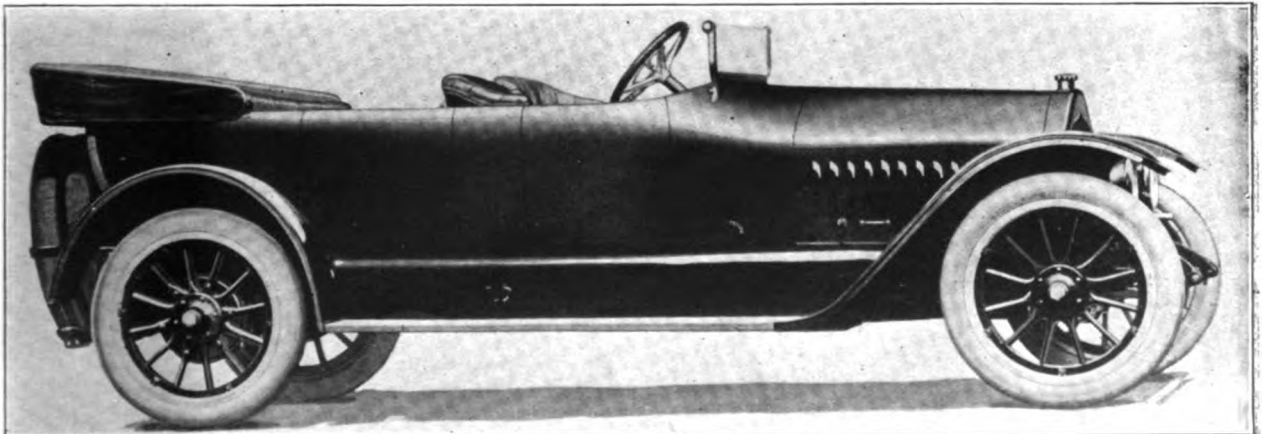
THE motor of the new 1916 National Twelve was designed and built in the National Motor Vehicle Company's factory at Indianapolis, and it has some features in which it differs from the other V type designs that have been produced during the past year.

Chief among these is the fact that the valves are on the outside of the cylinder blocks, so that two camshafts have to be used. This results in greater accessibility for the valves and for the electrical units that are mounted inside the V, and in addition it places the latter high and dry where there is little chance of short circuiting from water.

Cylinders are $2\frac{3}{4}$ inches by $4\frac{3}{4}$, and the motor in general is an excellent example of the high

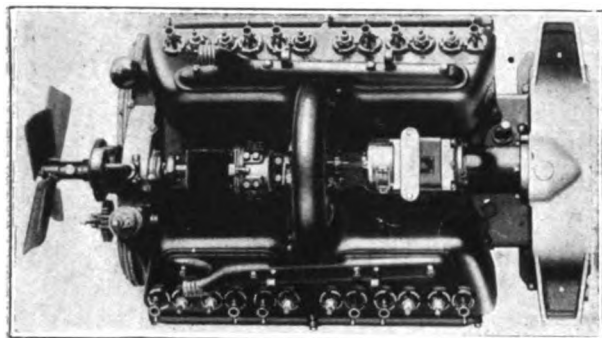
speed, long stroke, modern type. The cylinders are cast in two blocks of six each. While two camshafts are used, there is no need for rockers or other devices to synchronize the valve action, as each block operates separately.

Helically cut timing gears are used at the front end of the engine to drive the camshafts, in the same way as with an engine that has vertical cylinders. The drive for the Splitdorf magneto is a silent chain, which runs from the right camshaft to the fan pulley spindle. The magneto is a special type designed for 12-cylinder operation. The fan is attached to the same shaft with the magneto, so that the operation of the fan acts as a flywheel in steadying the action of the magneto. This magneto was developed under the



National Twelve Touring Model, Listing at \$1990—Normally of Four-Passenger Capacity, Seven Persons Can Ride in Comfort.

direction of the National engineers, and is the only one in use with a 12-cylinder motor. Other engines of this type use battery ignition.



Looking Into the National Twelve V, Where Starting and Lighting Units Are Located.

At the rear end of the V is the starting motor, which applies its power through the flywheel rim. The generator is alongside the crank case and is the only attachment that is carried outside of the V. The connecting rods are arranged side by side on the crankshaft, the cylinders being staggered one inch to permit this construction.

The lubricating system is of the pure forced feed type, as there are no dip troughs and splash is not depended upon. Oil is forced, under 10 pounds pressure at low speed up to 25 pounds pressure at high speeds, through a hollow crankshaft to the main bearings and to each connecting rod bearing. Separate leads feed the camshaft bearings, the timing gears and cylinders. An automatic pressure relief valve is used, which prevents the pressure becoming greater than 25 pounds. The oil pump is of the gear type and is located in a well at the bottom of the oil pan.

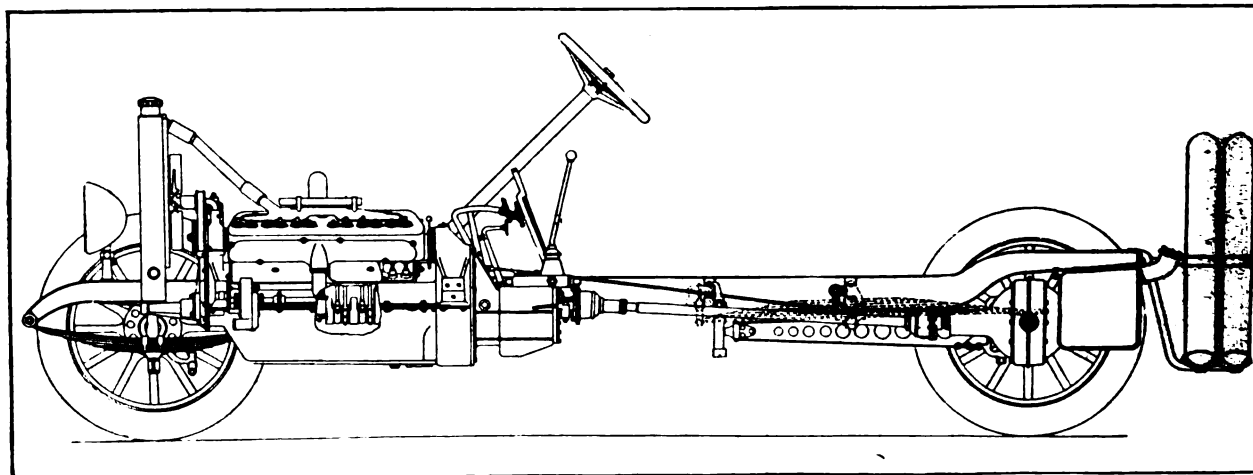
It is driven from the right camshaft. There is a screen on the suction side to keep the oil clean.

The water pump is a special type with a duplex feed, which forces the water to a passage cast in the aluminum crank case, where part of it goes through the crank case to the opposite cylinder and part of it goes vertically to the cylinder just above. This eliminates all but one very short exterior water pipe, except those which go from the top of the cylinder blocks to the radiator. Water passes directly from each cylinder block to the radiator without joining.

The radiator is similar to that used in the National "six," and the hood is similar, so that the two cars have very much the same exterior appearance. In the "12" motor the pistons are of aluminum alloy with three rings, and all of the reciprocating parts are made very light. This results in a motor that is lighter than any "six," with 15 per cent. lower power capacity and piston displacement, and makes for great steadiness in the motor at high speeds.

Like the Highway "six" the "12" has an aluminum leather faced cone clutch enclosed in a housing which carries the pedals, and a gearset providing three forward speeds and one reverse arranged on a selective principle. There is a tubular propeller shaft with two universals, and a full floating rear axle. Ball bearings are used throughout the gearset, while the axle runs on tapered rollers.

The rear spring suspension is of the cantilever type, with a flat rear spring very similar to that employed in the English Rolls-Royce. The swivel support in the centre of the spring is underneath, instead of above the axle, which is the common method with cantilever springs on



View of the National Twelve Chassis, Which Has Wheelbase of 128 Inches.

cars of American manufacture.

Parts of the steering gear have been made very large and provided with the greatest lever-



Driver's Compartment of the National Twelve, Showing the Location of the Control Components.

age to insure ease in steering, and there are ball thrust bearings in the front swivels.

The wheelbase is 128 inches. The regular four-passenger body, similar to that of the National "Highway Six," has neat, graceful lines, and is long enough to admit mounting two auxiliary seats so that six passengers can be carried in comfort. By filling up the tonneau, a third seat can be used, making a seven-passenger car. The price of the auxiliary seats is \$30 extra. The

driver's seat is movable and may be adjusted to the physical size of the driver. There is an aisle-way between the front seats.

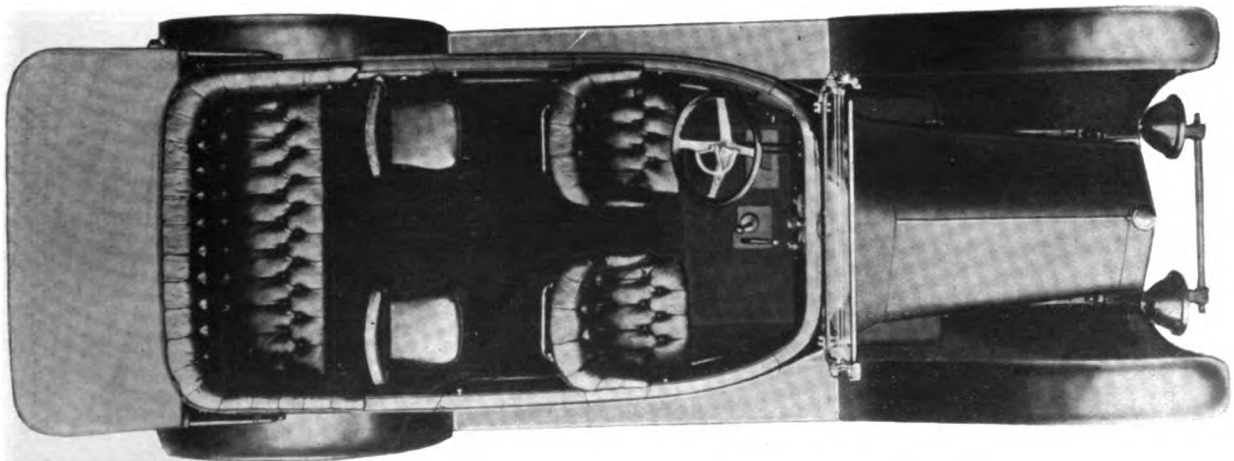
Tires are 36 by 4½ inches. The front of the frame tapers down very decidedly, so that in spite of the long wheelbase, the car can be turned in a 35-foot circle.

A 17-gallon gasoline tank is carried in the rear, and the feed to the carburetor is of the vacuum type. The price of the touring model is \$1990.

OVERLAND PRODUCTION INCREASES.

Two months ago the average daily shipments from the Overland plants reached 400 cars. Enlargements of the plant to make 600 cars a day possible have been underway, and on Aug. 26 the production reached 502 cars. It is now averaging about 500 a day, with assurance that President Willys' prediction of 600 cars a day will be reached by the end of the year. Export shipments, while an inconsiderable part of the total production, have been 217 per cent. greater this year than last, notwithstanding that the company has had no war orders, but that all of its cars abroad have been sold through dealers to private individuals. The number shipped since Jan. 1 to Aug. 20 was 4006 cars, while last year for the same period 1845 Overland cars went out of the country.

Dr. D. Harold Walker of Boston in a paper in the Journal of the American Medical Association, declares that motoring impairs the hearing and develops a condition which he calls "motor ear." It is caused by abnormally swift passage through the air and by dust.



Interior View of National Twelve Body, Showing Location of Auxiliary Seats and Ample Leg Room.

OVER 2,000,000 CARS IN UNITED STATES.

AS COMPLETE an accounting as possible of the motor cars registered in the United States up to July 1 indicates a gain of 334,809 cars for the six months and a total of 2,070,903 machines in use. This is the first accurate accounting of registrations that places the number above two million.

The great extension of the automobile market in the United States is shown by the fact that in 1911 there were only 677,000 cars. Estimated production of cars and trucks for 1915 is 600,000 units. Over half that number have already been added to the registration. Of course a large num-

mobiles registered throughout the country.

New York gained 25,302 cars in the six months, as compared with 37,302 the 12 months in 1914, showing a considerably accelerated rate of gain. Michigan gained 22,085 and Pennsylvania 22,016. Michigan's gain is already larger than that for the entire year of 1914 and Pennsylvania is two-thirds as large. Gains for the six months in some of the other states are as follows: Illinois, 19,494; Iowa, 18,000; Wisconsin, 16,108; Indiana, 15,708; Oklahoma, 15,640; California, 15,499; Minnesota, 4,635; Missouri, 14,635 and Nebraska, 10,000.

Automobile and Motor Truck Registrations Ending June 30, Allowing for Duplicate Registrations.

New York.....	185,767	Virginia.....	17,799
Ohio.....	152,950	Maine.....	16,865
Illinois.....	151,832	North Carolina...	16,315
California.....	138,600	South Carolina....	16,000
Pennsylvania....	128,062	Rhode Island.....	15,000
Iowa.....	117,407	Kentucky.....	14,820
Michigan.....	93,669	Florida.....	12,493
Minnesota.....	82,000	West Virginia....	12,000
Indiana.....	81,208	Alabama.....	11,800
Massachusetts....	76,168	Montana.....	11,000
Texas.....	72,433	New Hampshire....	10,422
Wisconsin.....	70,490	Vermont.....	9,489
Missouri.....	64,460	Dist. of Columbia..	8,500
Nebraska.....	60,000	Mississippi.....	8,500
Kansas.....	59,485	Arkansas.....	7,200
New Jersey.....	58,179	Utah.....	6,615
Washington.....	35,000	Idaho.....	5,928
Connecticut.....	34,199	Arizona.....	5,426
Maryland.....	25,732	Delaware.....	4,135
Oklahoma.....	25,000	Louisiana.....	4,000
Tennessee.....	24,951	New Mexico.....	3,695
North Dakota....	24,000	Wyoming.....	3,262
South Dakota....	22,700	Nevada.....	1,190
Georgia.....	22,150		
Colorado.....	21,538		
Oregon.....	20,419		
		Total.....	2,070,903

ber are absorbed by the export trade and the large shipments that are being made to the European belligerents, and not all will appear in the registrations at the end of the year.

The most remarkable feature of the registrations is the speed at which they have increased in states where the population devotes itself chiefly to agriculture. This is particularly true in the middle western wheat belt states where the farms are large. It bears out the showing in the census figures that per capita income is much higher in the country districts than in the city.

Ohio has made the largest gains of any state during the past six months, showing an increase of 32.096 in six months as compared with 36,348 during the entire year of 1914. The total for Ohio is now 152,950 which places that state next to New York and second in the number of auto-

NEW ENGLAND DEALERS PROSPEROUS

What he considered to be exceptionally favorable conditions for the automobile trade in New England, were observed by F. L. Jewett, manager of the foreign sales of the Paige-Detroit Motor Car Company, who has just returned from a 2386-mile trip through the district.

He found the New England factories working overtime. There is a tremendous amount of war order business, Connecticut industries alone being employed on orders that total \$300,000,000. The cotton mills of Massachusetts are doing a large business, and the bankers report that during the past five months there has been a large increase in savings accounts and commercial business.

Touring in the New England district has reached unprecedented volume this season, and the hotels are doing a very large business. Mr. Jewett encountered a large number of Paige cars from all parts of the country.

DATA ON EUROPEAN WAR TRUCKS.

The Internal Gear Drive Association of Detroit has received from Europe some valuable data on the experiences of the belligerent European nations with internal gear drive trucks. Engineers, manufacturers and army officers have aided in collecting the material, which is very complete and is of much value to truck manufacturers. Parts of the reports dealing with new developments in internal gear drive design are retained for the benefit of the members of the association but other facts regarding truck use in war will be turned over to any truck manufacturer who desires it.

NEW REO LIGHT DELIVERY WAGON.

ENGINEERS of the Reo Motor Truck Company worked two years on the design out of which they developed the Reo shaft driven 1500-pound capacity delivery wagon, known as model F. This design has many features that have proven so successful in the Reo model J, two-ton capacity, and is built of the same high-grade materials and contains the same workmanship. It is designed to meet the increasing demand for a light and quick delivery wagon.

Experimental machines were driven across country for thousands of miles, the drivers selecting all kinds of road and weather conditions for purposes of thorough tests. After this test the machine was torn down and examined. In the completed model now offered all parts are designed with 50 per cent. excess strength to insure long endurance and maximum service.

The motor is rated at 35 horsepower. It is a four-cylinder type, with cylinders cast in pairs and with heads integral. Bore is $4\frac{1}{8}$ inches and stroke $4\frac{1}{2}$. A plunger pump forces oil to the main bearings and timing gears, the excess supplying a constant level in the engine base for splash oiling of the pistons, cylinders, wristpins, cams, camshaft and valve tappets. The poppet valves are exceptionally large. The inlet is in the head, with $1\frac{3}{4}$ inches clear diameter and the exhaust valve is at the side.

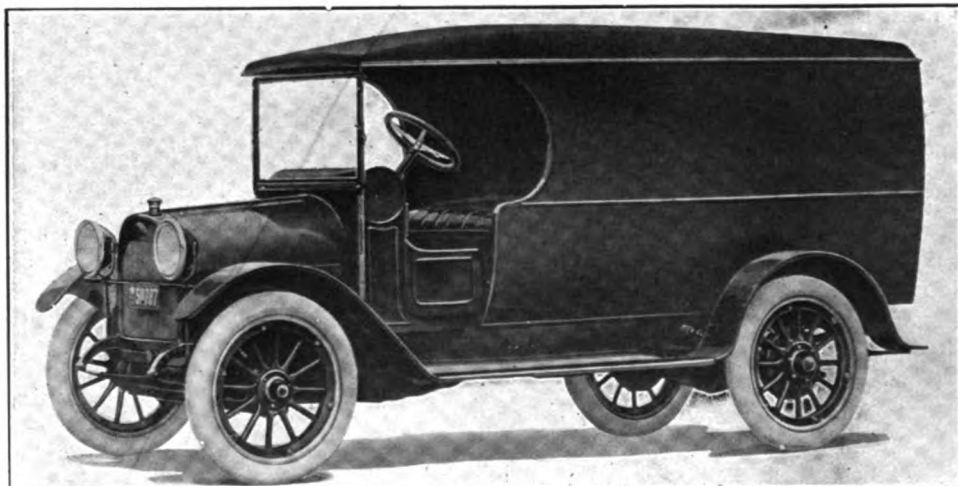
The crankshaft is of drop forged manganese steel, heat treated and ground. The main bearings are adjustable from the exterior of the case. The cams are forged integral with the camshaft, which is mounted in die cast bearings. The timing gears are helical cut. The motor is mounted on the sub-frame at four points.

A float feed type of carburetor is used. It is water jacketed. The exhaust manifold has a stove to which the air intake is connected, and

the air supply is controlled from the dash. Ignition is by jump spark current supplied by the Remy generator, which also keeps the battery charged to supply the electric lights and electric starter.

The Remy two-unit, six-volt starting and lighting system is employed, and the starter is mounted over the front end of the transmission gearset. There is a 100 ampere-hour storage battery. Two-thirds of the current ordinarily used in the two parabolic headlights is saved by a dimming device.

The clutch is a dry disc type of 13 plates. The sliding selective transmission gearset has three forward speed ratios and reverse. Hyatt roller



The Reo Shaft Driven 1500-Pound Capacity Delivery Wagon Chassis with a Rear Door Full Panel Body.

bearings are used throughout. The drive is through a propeller shaft, with two enclosed universal joints, from the transmission gearset to the bevel gears in the rear axle.

From engine to rear wheel the gear reductions are 4-1 on high, 7.2-1 on intermediate, 14.8-1 on low, and 20-1 on reverse. Two sets of brakes, internal expanding and external contracting, operate on 14-inch rear wheel drums with $2\frac{1}{4}$ -inch faces.

The rear axle is a full floating type. One or both shafts may be removed without jacking the chassis, thus allowing the withdrawal of the differential and the drive gears. Timken bearings are used for the differential and rear wheels. The pressed steel axle casing is electrically welded into a one-piece housing, which is very rigid.

Wheelbase is 120 inches, with 56-inch tread, and wheels are artillery type. The tires are 34 by 4½ pneumatic, plain tread in front and knobby at the rear. The truck has a turning radius of 22½ feet.

The drive is left side, with centre control levers. The price complete, with a standard express body and canopy top, is \$1075 f. o. b. Lansing, Mich. The chassis alone is sold for \$1000.

MUCH TRAVEL IN YELLOWSTONE.

The first 10 days after the opening of Yellowstone park to motor cars, 321 cars, with a total of 1190 people, passed through the park without accident. At the same time horse travel was the heaviest that the park had ever known. Of the cars which went through, 151 came in at the west entrance, 86 at the north, 83 at the east, and one at the south. Col. Brett, in charge of the park, says that motorists have shown every disposition to aid him in enforcing regulations and that they have been very careful to avoid difficulties with the horse teams. He now permits cars to travel at night in cases where it would be impossible to make the park trip otherwise because of limited time.

Assistant Secretary of the Interior, Stephen T. Mather, announces that the old Tioga road has been improved so that entrance to Yosemite park may be reached from the east without a long detour to the western entrance. The road is in excellent condition, but those who travel it must take a large supply of gasoline, as none is obtainable on the route.

DEAF MUTE CAN'T DRIVE.

Highway Commissioner Dill of New Jersey has revoked the driver's license of Charles H. Over, Jr., of Asbury Park, N. J., because he is a deaf mute. The license had been secured by a demonstration of driving in a car equipped with special mirrors by which the mute driver could plainly see vehicles approaching from behind. But the commissioner held that good hearing is essential to a competent driver.

AUTO TRAFFIC MANAGERS MEET.

Traffic managers of the companies that are members of the National Automobile Chamber of Commerce are to meet in Detroit, Sept. 14. Subjects to be considered are, extra demurrage

charges on cars held in freight cars at destination, whether batteries can reasonably be considered a component part of engine starters and subject to the same rates, damage to cars through sparks and cinders entering cracks around doors on freight cars, consideration of ruling by express companies that carload rates do not include wagon service and that extra charges must be made for switching.

MASSACHUSETTS LIGHT REGULATION.

The advisory committee of Massachusetts motorists appointed to confer with the highway commission regarding headlight regulation has reported in favor of a regulation enforced by the commission with the governor's approval requiring that some device be used to keep the rays of headlights not more than four feet above the ground and for 10 feet on each side of the car at a distance of 10 feet from it. This coincides with the views of the commission, and the regulation will probably be promulgated. Painting the top of lenses or covering them with tissue paper or cheese cloth will have the desired effect.

MODIFIES MOTORCYCLE BAN.

After conference with motorcycle manufacturers, Postmaster-General Burleson has modified his orders that rural mail carriers may not use bicycles or motorcycles by approving the use of motorcycles with side car attached.

This equipment enables the carrier to haul a sufficient amount of mail to meet the necessary conditions, makes accidents from falls unlikely and should be as efficient as the small automobile in the postmaster-general's opinion. Bids for motorcycles with side cars have been asked for by the department.

LONG TRIP IN NEW CAR.

The "Paige 46," purchased by L. M. Yoder of Belleville, Penn., was taken directly from the freight car in which it was shipped, loaded with necessary luggage, and started without adjustment or trial on a 9000-mile trip to the Pacific expositions and return. From Pennsylvania to San Diego the daily run was 225 miles on the average and no running was done after nightfall. Coming back by the northern route the car was driven through a sea of mud, but it got through all difficulties.

INDUSTRIAL HAPPENINGS AND COMMENT.

THE Scripps-Booth Company, Detroit, Mich., is erecting a thoroughly modern three-story, fireproof factory that is expected to have a capacity of 100 cars a day. This addition is significant of the remarkable rise of this company, which is about a year old. The officers expect a banner year for 1916.

The Timken-Detroit Axle Company, Detroit, reports that the new worm drive axle plant recently finished is now in operation with a full new equipment of machinery. This plant gives about 100,000 feet additional to the company's working space. Progress on the new drop forge plant, which it is said will be the most complete of any in the middle west, is being finished rapidly. The new upright boilers are in place and the steel frame work is now being erected.

The "Detrolter" Motor Car Company, Detroit, is advised by its Birmingham representative in England, Messrs. Bell, Johnson & Co., that \$20,000 in gold which was shipped by them to their New York brokers to apply on cable orders for Detrolter cars, was lost on the "Arabic," torpedoed by a German submarine. New credits to cover all shipments ordered have been posted.

The Detroit Steel Products Company, Detroit, Mich., recently installed a new type of oil burning rotary furnace, the only one of its kind in existence. Operated by electricity, the floor revolves, while jets of air and fuel are shot into the furnace at great velocity. The heat generated is from 1450 to 1575 degrees Fahrenheit. The furnace has many advantages over the former methods of treating steel springs, and performs the work of four or more ordinary equipments. Its operation requires seven men and it treats about 50,000 pounds of steel per day.

Bert Collins, late of the Studebaker Corporation, has joined the King Motor Car Company as special factory salesman. His position is a new one created for the purpose of making jumps to certain places where co-operation with dealers, old or prospective, is needed. He will have no particular territory.

The Packard Motor Car Company, Detroit, recently entertained for four days at its plant 80 mechanical experts, representing the technical departments of the Packard dealers and branches throughout the country. J. G. Vincent, vice president of engineering, and other factory executives, spoke.

The Yuster Axle Company, Cleveland, O., announces the change of its corporate name to the Columbia Axle Company. This change follows the withdrawal of M. L. Yuster from the company and removal of the Torbenson Gear & Axle Company from Newark, N. J., to the Yuster plant. Hereafter the combined product of the two companies will be made under one management and overhead expense in the same shop. Plans for new buildings and machinery are now under consideration.

The Henshaw Motor Company, Boston, Mass., dealer in Dodge Brothers cars, has leased the large, new fireproof building at 915-921 Boylston street, which was erected a few years ago especially for automobile purposes. The company, however, will retain its service station in the Motor Mart at Park square, using the new location for executive and sales purposes. The company will have about 30,000 square feet of floor space, with

two entrances on different streets. Another announcement is that the Henshaw company has added Worcester county to its territory, placing S. H. Baker in charge of the branch at 27 Foster street.

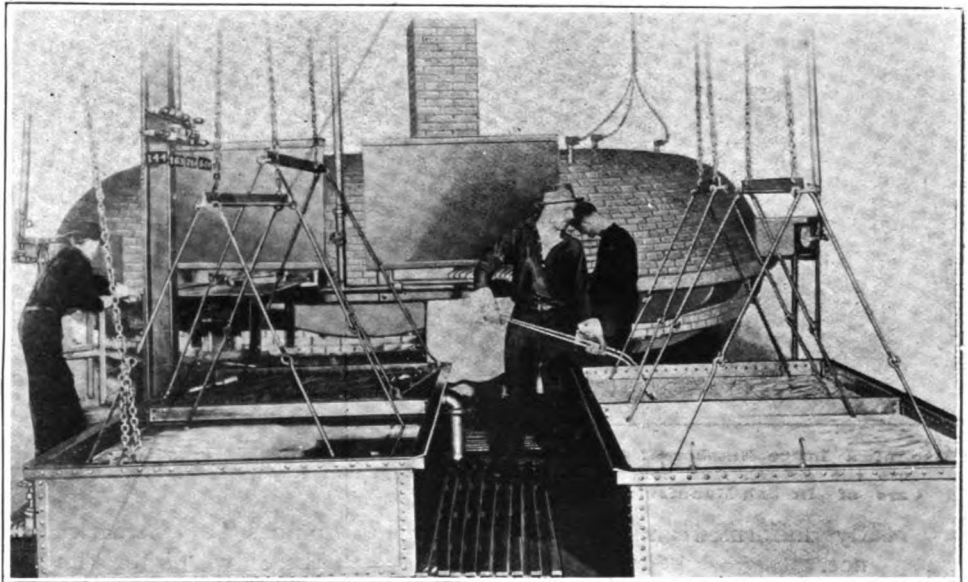
The National Motor Vehicle Company, Indianapolis, is building a large addition to its 22nd street plant. The improvement includes remodeling of the present offices. The general offices have been removed to 426 North Capitol avenue, the local company branch, pending operations.

The Lenox Motor Car Company, Boston, Mass., is planning the erection of a reinforced concrete factory to cost \$100,000 at Lawrence, Mass., and is said to be on the point of entering the commercial car field.

The Crane Motor Car Company's plant at Bayonne, N. J., has been purchased by the Car Lighting and Power Company. It will be used by the Clothel Company, a subsidiary of the Car Lighting company, which manufactures refrigeration systems.

The Ford Motor Company, Detroit, was visited by 65,183 persons during the fiscal year ending Aug. 1. During the 300 working days the visitors averaged more than 210 daily. The high mark was reached for the month of September, 1914, when 11,890 persons entered the plant during the 26 working days.

The Rhode Island Motor Car Company, Providence, R.



New Oil Burning Furnace Installed in Detroit Products Company's Plant—The Only One of Its Kind in Existence.

I. was recently reported bankrupt, and the final meetings have been held. The accounts of Trustee Alfred G. Chaffee were approved and he was discharged. The scheduled liabilities of the company were given as \$27,556.55, all unsecured, and the assets as \$17,955.97.

The John O. Heinze Company has been organized in Springfield, Mass., by William Pfum, formerly vice president and general manager for the National Cash Register Company, to manufacture electric starters for automobiles. Mr. Heinze, formerly chief engineer of the Northway Motor Company, Detroit, is vice president and chief engineer. Production is expected to begin within 60 days.

The King Motor Car Company, Detroit, recently entertained about 150 representatives of companies that make parts for the King eight-cylinder car at a camp near New Baltimore, Mich. On behalf of the King company, Artemus Ward, Jr., president; F. A. Vollbrecht, vice president and general manager; J. B. Sigfried, assistant general manager, and Chief Engineer Chase made speeches.

MOTOR VEHICLE NEWS FROM ABROAD.

IN VIEW of a shortage of male mechanics in England women have taken up the work of driving light trucks and commercial wagons in civilian pursuits. A number of department stores and other large business concerns have women employed for that work, and the companies having contracts for hauling mails have also placed women in charge of their cars.

The view reproduced on this page shows a number of women drivers employed by J. Blake & Company, Liverpool, to drive mail vans from the stations and wharves to the postoffices. They

appoint local agents, to give them liberal terms in paying for their stocks and to keep a considerable supply on hand. At present the roads outside of the cities are very bad, but improvement in this respect is possible.

FARM TRACTORS IN FRANCE.

A public demonstration was recently given in France of the utility of farm tractors and motor plows, nearly all of the machines being of American manufacture. France feels that the lack of horses and of men that will be felt after the war will make it necessary to employ to the limit any labor saving machinery that may be available in farming.

The French find that most of the American machines now available have been planned for farming on a larger scale than is usual in France, and to have been designed with a view to soil conditions that do not prevail there. Still there are many American types that can be used, or will be available after slight changes in design have been made.

Count Pillet-Will, a large land owner not far from Paris, recently tested on his estate six motor agricultural ma-

chines of American manufacture. Among these were the large Aultman-Taylor tractor, the Bullock "caterpillar" tractor, the Bull gas tractor and the Twin City Twentieth Century tractor. Great interest was shown in the demonstrations and the French predict that the expense to American manufacturers who sent machines and expert men for the demonstrations will be amply repaid by sales that will shortly be made.

BRITISH MAKERS BADLY FRIGHTENED.

The unprecedented reduction of prices in American motor cars that has taken place during the summer, and the new developments in American design, have raised in the minds of the British manufacturers an acute fear that when the



One of a Large Number of Overland Delivery Cars, Which Have Gone Into the British Mail Service Since the War Began in Replacement of Cars of British Manufacture.

are neatly uniformed and present a very good appearance.

Women have been found to be careful drivers, and their work is quite successful on light cars. They are not generally capable, however, of making many repairs and the majority have not the physical strength to handle heavy trucks and their loads.

AMERICAN MOTOR CARS IN CHINA.

There are 600 motor cars in Shanghai, China, and the number is increasing rapidly every year. Most of those at present in use are owned by foreigners, but the well to do Chinese are becoming interested and it may not be long before they begin to buy heavily. To sell them Vice Consul Gustave J. Barrett reports that it is necessary to

war is over they will be unable to hold a large part of their export business and their sales in England will be greatly reduced.

While they have been making war material their factories have been busy to capacity and they have been making money. The terms under which they do the work, however, make it impossible to acquire a larger profit on war supplies than one-fifth greater than the average for three years preceding the war.

They have been unable to accept private orders for either cars or trucks. The large English distributors, finding it impossible to secure either English vehicles or those they formerly imported from the continent, have eagerly taken up representation of American products, and for the time being are pushing them with all their resources in order to keep their businesses afloat.

This has introduced American products to the trade and to a large number of buyers whom American manufacturers would have found it exceedingly difficult to reach otherwise. Hundreds have discovered that the habitual talk in England about "cheap American cars" and "English quality" has been much over done, and that the American car really offers as much or more than the English vehicle at a lower price. This is likely to assure a much larger consumption of American cars after the war has closed.

Recent great reductions in American prices, accompanied by equally great improvements of American design, will make American competition even stronger. English designers have been unable to do anything new since the war started and the English manufacturers will be in the position of trying to sell two-year-old models, built by two-year-old methods, against strictly up-to-date American machines.

Somebody has started the story in England that American manufacturers plan to flood Europe with their products the minute the war is over. The boats are all chartered, they say, and great supplies will start over the Atlantic as soon as peace is declared. Americans in touch with the situation know that most of our manufacturers have been steadily pushing their English trade and are already shipping all they feel that market will absorb. Such a spectacular "American invasion" as the English imagine is not probable.

The story, however, presents something definite for the English trade to use in its campaign for a protective tariff with which to run up the prices of American cars in England. The English people are constitutionally free traders and previous cries of the motor manufacturers there for

tariff relief have been futile. The war, however, has created exceptional circumstances and may have unprecedented results.

AUTOMOBILE TIRES FOR BRAZIL.

Although crude rubber is one of the largest exports from Brazil, there are no tire factories there and all that are used have to be imported. European tire makers have always secured most of the business, not because their tires were better, but because they devoted more attention to developing sales.

During 1914 business was depressed in Brazil and the number of tires sold fell off greatly. England and Belgium, which have gone so far as to provide tires of standard American sizes for American cars, sold more tires than in normal years, while the imports from France, Germany and Italy declined.

The situation was somewhat upset by the passage of a law requiring a 50 per cent. ad valorem duty instead of five per cent. on all tires not made of fine Para rubber, which comes from Brazil. The customs officials found it impossible to determine the source of the rubber and after a few days began admitting tires on payment of the five per cent. duty and a promise to pay the other 45 per cent. if congress does not repeal the fine Para law.

There is a good opportunity for the development of American tire sales in Brazil.

ENGLISH ADAPT CATERPILLAR DRIVE.

Taking a lesson from the Germans, who have used caterpillar drive trucks to haul their big guns and heavy equipment through soft ground, the English have designed a caterpillar drive tractor with a single wheel in front by which steering is accomplished.

This is designed for haulage over rough and uneven ground, sandy and semi-boggy ground, and for climbing grades that cannot be made by the ordinary type of truck. Trucks fitted with caterpillar drive are also in use.

Imports of automobiles into Canada during the last 12 months were \$11,000,000 less than for the preceding year, amounting to \$7,420,000, as compared to \$18,560,000. Imports of nearly all other products suffered accordingly, the total for the year being \$436,139,167, as compared with \$591,340,962 for the previous year, or a loss of \$155,000,000.

PROMINENT RACE EVENT ABANDONED.

THERE is to be no Los Angeles to Phoenix road race this year. All efforts to promote the "Cactus Derby" for this year have failed. It was not received well last year in Arizona, partly because of the unpopularity of some of the promoters and partly because the improvement of the roads between the two towns has removed its early difficulties and made it a semi-speedway affair. Traffic over the roads has increased greatly and it has been found impractical to keep the usual traffic off of them for a full day.

LOZIER MAY RE-ENTER RACING.

Ralph Mulford recently visited the Lozier factory in Detroit in company with Louis Chevrolet and went through the plant with officials of the company to consider the possibility of producing racing cars there again. Maurice Rothchild, vice president of the company, is known to strongly favor re-entering the racing field. The entry at the last moment of a Lozier car in the Elgin road races, indicates that the company is strongly considering racing again, and it is quite possible that Mulford will head the team if one is formed.

MERCERS TO RACE IN JAPAN.

Two Mercer raceabouts have been purchased by Fred J. Fujioka of Los Angeles, who is to take them to Japan, where they will head a team of racing cars which he is to put through their paces for the benefit of the Japanese public. The cars will be driven by Japanese drivers, W. T. Watanabe and H. Sakamoto. The first race will be held in Tokio at the celebration in commemoration of the coronation of the Emperor.

LOUISVILLE SPEEDWAY PROJECTED.

Three hundred acres of land near the Douglas Park Race Track in Louisville, Ky., have been leased by a group of Louisville and Cincinnati capitalists, and upon it a two-mile speedway, to cost \$250,000, is to be constructed. Work will begin in the fall and the track is expected to be ready for a meet next spring. Mueller & Martin, Louisville real estate dealers, are interested in the project, and Carl G. Fisher, president of the Indianapolis Speedway Company, is said to be associated with them. Others who have a share

in the affair are Louis Seelbach, president of the Seelbach Hotel Company; Patrick J. Hanlon, former vice-president of the American Tobacco Company; Frank Fehr, president of the Frank Fehr Brewing Company; Basil Doerhofer and J. H. McKee. The track will be of wood and will be constructed of two-by-fours laid on edge.

NARRAGANSETT RACE ENTRIES.

Entries for the 100-mile race at the Narragansett Park Speedway, Sept. 18, include Eddie O'Donnell, Peter Henderson and Willie Haupt. O'Donnell contested first place with De Palma and Burman at Des Moines until tire trouble put him out 30 miles from the finish. Haupt was one of the three leaders in the grand prize race at Savannah in 1910. Henderson finished sixth in the Des Moines race this year.

ONE DAY FOR TACOMA RACES.

It has been decided that the 1916 Tacoma race meet will be compressed into one day with two events, the 300 or 350-mile main event and the Intercity race. For the chief number on the programme, prizes of \$10,500 will be offered. There will be prizes for the leader at each 100-mile point, to prevent any lagging on the part of the drivers and insure a faster race.

KLEIN WINS AT NIGHT.

In a night race by lamp light, Arthur Klein, in a special Maxwell racer, turned the Cleveland track in 49 1/5 seconds on Aug. 28, establishing a new record for night racing and defeating the Simplex Zip and other famous speed cars, including Briscoes, Cases and other members of a large field.

NEW ORLEANS BUILDING SPEEDWAY.

The New Orleans Motor Speedway Association has been incorporated in Delaware with a capital stock of \$1,000,000. The incorporators are S. W. Lindsay and J. C. Williams of Chicago. They say the track will cost about \$500,000 and will be ready for a long distance race the Saturday before the Mardi Gras festival opens. This Mardi Gras race will be made an annual event.

SUGGESTIONS FOR THE FORD CAR OWNER.

Wiring of the Ignition System, Regulation and Control of the Current, the Function of the Timer and the Creation of the Firing Spark.

The 31st article dealing with the construction, operation, maintenance, care and repair of the model T Ford chassis is devoted to the consideration of the wiring of the ignition system and the functions of the devices for controlling and firing the fuel gas in the engine cylinder.

THE condenser is a number of sheets of thin tin foil that are cut with a lug or ear at one end. These sheets are assembled with sheets of waxed paper between them for insulation, and with the lugs so placed that those of each alternate sheet may be connected together, or all the sheets may be connected together. When all the negative and all the positive sheets are connected in two groups the connection is said to be made in multiple, and this arrangement will afford low voltage effects. When the lugs of the sheets are all connected in one group, that is, the positive and negative sheets connected one to the other, the arrangement is said to be in series, and this will afford high voltage effects.

The purpose of the condenser is to absorb the excessive pressure resulting from the breaking of the flow of the current and the accumulation of a higher potential which, without condensation, would cause excessive sparking at the platinum points of the vibrator blade and the adjusting screw, which would quickly cause deterioration and consequently faulty operation. The intense heat of the larger spark produced would burn and pit the platinum and frequent replacement would be necessary.

The Purpose of the Condenser.

The condenser is charged with the current during the time the circuit is open, and when it is again closed the condenser discharged into the line until its pressure is that of the line. Another way of expressing its function would be to state that in it is stored sufficient current as the circuit is broken to minimize or reduce to a point of safety the pulse-like waves of current caused by

the opening and closing of the circuit.

The condenser is proportioned to meet the demands of the current with which the coil is to be used. Whenever the primary winding is energized, it must produce an induced current of a given value in the secondary winding, and this may be from 8000 to 10,000, or even a greater number, volts. This will necessarily create a spark of corresponding intensity at the spark plug electrodes, where the current will "jump" or bridge the gap as frequently as the circuit is opened and closed. This high voltage must cause great pressure in the circuit, but the amperage is correspondingly low, for only sufficient current is drawn to bridge the gap. Because the spark is

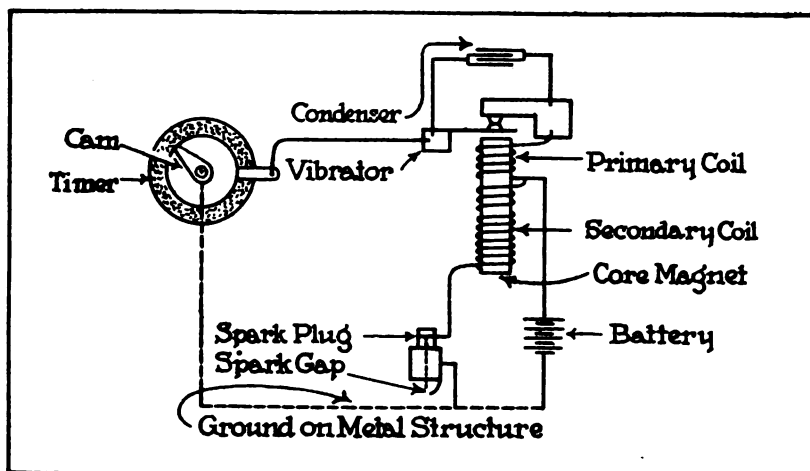
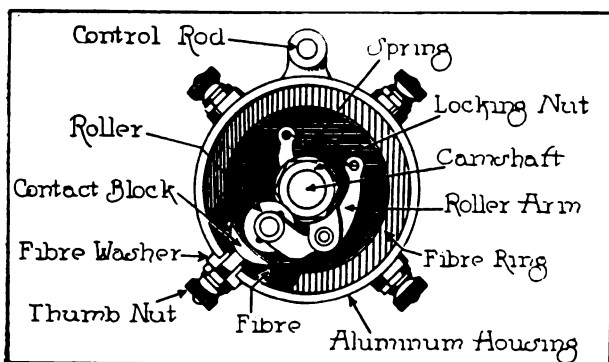


Diagram Showing the Jump Spark System of Gas Engine Ignition, in This a Battery Instead of a Magneto Supplying the Current.

caused to appear at the air gap the system is generally known as the "jump spark." When the current is created by a battery there is always a sufficient value drawn to make a spark until the potential is so low it will no longer energize the coil, which explains why a battery current may suddenly fail.

How the Current Is Broken.

When the current is produced by a magneto the machine must be turned to a speed where it will produce an energizing current, and from that point on the current will increase in value as the number of revolutions a minute is increased, for a definite number of sparks is produced each



The Members and the Arrangement of the Timer Used for Ignition Current Distribution on All Ford Engines.

revolution. In the operation of the coil, when the platinum points of the adjusting screw and the vibrator blade are in contact, the circuit is closed. When the core of the coil is energized its magnetism will draw the metal button of the vibrator blade toward the core, which opens or breaks the circuit. When the magnetic influence of the core ceases the vibrator blade, which is under tension, will spring back so that the platinum stud will contact with the stud on the end of the adjustable screw, closing the circuit and creating a spark. This process is repeated so long as the circuit is maintained.

The Wiring of the System.

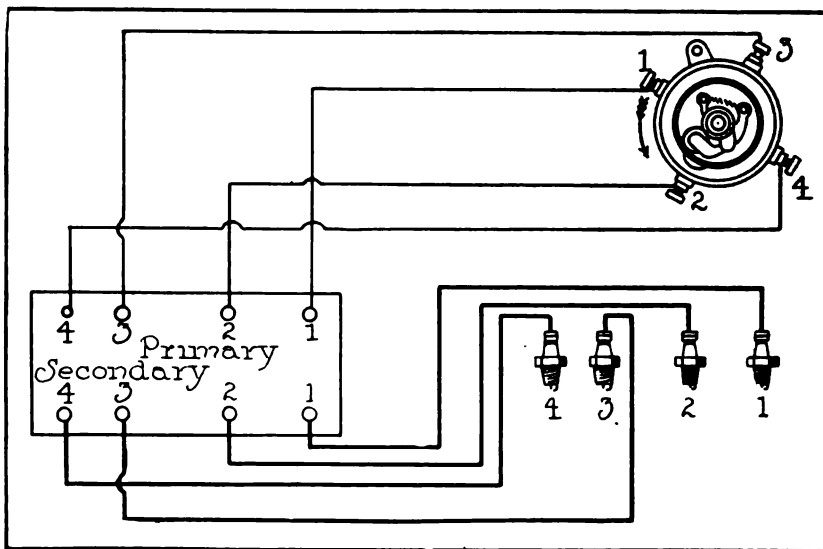
The wiring from the magneto or battery to the coil is known as the primary, this carrying the initial current, and in this there is a manually operated switch to open and close the circuit. The system includes four coils, one for each cylinder, and the current is carried from the magneto or battery through the contact on the engine case and the cable to the primary connections of the coils, thence to the commutator or timers that is mounted on the front end of engine case and back through the metal parts of the engine to the magneto, or battery. This is the path of the primary current. The secondary current, which is induced in the coils, is led by the secondary wiring of the system from the coils in the cylinders, the remainder of the path being through the engine case to the timer.

As will be noted in the accompanying sketch of the system, there are two primary terminals, which are the lowest of the

series on the coil box. To one of these the cable from the magneto is attached. The other is for the attachment of a battery if this is used. The upper series of four plugs are the terminals of the primary winding by which the primary current is taken to the timer. These terminals, from left to right are respectively numbered 1, 2, 3 and 4, and from these the cables or wires are led to the timer, the wires, for convenience in identifying them, being insulated with black, red, blue and green coverings. The terminals of the timer case are numbered to correspond to the primary terminals of the coil box and the black wire should be attached at No. 1, the red wire to No. 2, the blue wire to No. 3 and the green wire to No. 4. The primary wiring from the coils to the timer is enclosed in a case that is known as an electrician's loom, which is a tube that protects the cables from contacting with the metal of the engine case and wearing the insulation, and prevents saturation with lubricant or water. The ends of the wires are free and are fitted with terminals for attachment to the coil box and the timer. The secondary wires from the middle series of terminals of the coil box are single, these being shorter, so there is less probability of them being worn or soaked.

The Function of the Timer.

The current is made and broken and the circuit is closed or opened by the timer, this being an instrument that has an extremely important function. By this the spark is created in the cylinder at the precise time to explode the gas, and it ought to be extremely positive and accurate in its work. The timer is in effect a mechanical



Arrangement of the Primary and Secondary Wiring, from the Timer to the Coils, and from the Coils to the Spark Plugs.

switch that is operated by gearing from the engine shaft, the gearing being so designed that it will turn a shaft that projects into the timer case. The case is a shell of aluminum, which is lined with a ring of fiber or vulcanite. In this fiber ring at 90 degree intervals are located the contact plates. To these plates are fixed the terminals which project from the outside of the casing, being properly insulated from the case.

The shaft of the timer extends into the centre of the casing and on this is mounted a lever arm that has a roll at the outer end and a spring that keeps the roller firmly in contact with the fiber ring at the other end. This roller is of large size and is made of hardened steel. The contact plates are hardened steel and are very enduring. As the shaft is turned the roller on the lever arm contacts with the plates, and as the roller moves across the plates it makes and breaks the circuit. If the coil switch is set to make a battery or magneto current, current will flow from the magneto or battery through the timer and to the particular coil unit to which the contact plate is connected by wire, and this influence will cause a current to flow through the secondary wire to the spark plug. As the roller leaves the contact plate the circuit is broken or opened.

How the Spark Is Created.

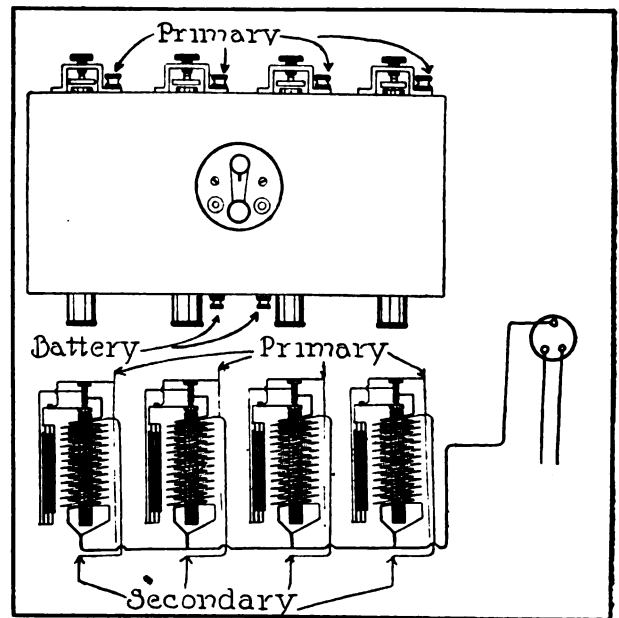
The current as it reaches the spark plug passes through the central electrode and "jumps" from the point of it to the point of the other electrode in the shell of the plug, and then passes through the engine cylinders and the case to the battery or magneto. When the current is made it must pass from the one electrode to the other, and the spark is the arcing of the current between the points. The spark will continue so long as the roller and the plate in the timer are in contact.

The reader will recall the statement made relative to the law of magnetic attraction by which doubling the space between two poles will diminish the intensity of the magnetic field to one-quarter, and if tripled the field is reduced to one-ninth, etc. This fact is of great importance with reference to the position of the points of the electrodes of the spark plugs. If the space between them is less than what is necessary to produce an efficient spark, the spark will lack intensity and will not cause the combustion of the compressed fuel gas in the cylinder. If the space is more than it should be a greatly increased resistance will result and the spark will be correspondingly inefficient.

The best average result for ignition with a

battery current can be obtained with the electrodes spaced 1/32-inch, unless the battery is much reduced in potency. With magneto ignition the space between the spark plug electrodes is generally less, being from 1/50 to 1/64-inch, dependent upon the design. But the spark gap specified for the Ford system is the same as for a battery 1/32-inch. The potency of the electric current drawn from a battery of dry cells will depend upon the voltage, which may be regarded as 1.5 if the cell is in good condition, and the amperage flow may be from 15 to 20. The voltage of the lead-acid cell is approximately two volts and the amperage will be from .2 to two amperes.

The reason for the difference in amperage is the greater internal resistance of the lead-acid cell. The amperage of the magneto is low, but



The Make-Up of the Four-Unit Coil Box and the Arrangement of the Coils in the Case and Their Connections.

the voltage will increase with the speed of the engine driving it, and to obtain a spark at low speeds the spark plug electrodes are ordinarily in other systems closer together. The closer relation is also desirable with the higher speeds because an intense spark would be more or less destructive of the electrodes.

Peculiarities of Current Source.

The reader should remember that current drawn from a battery will produce at the air gap what may be regarded as a uniform spark without reference to engine speed, while the proportions of the spark with a magneto system depend entirely upon the speed of the machine. The fact that a battery will become exhausted and must be

replaced or recharged, that the condition cannot always be determined accurately, that replacement is not always possible and failure is a serious inconvenience, are some of the reasons why the magneto has been regarded as superior to the battery as a source of current supply. But generally an ignition system that includes both a magneto and a battery is preferred, the battery current being utilized for starting and for emergencies, and the magneto for current production after the engine has begun firing. The combination of the battery with the magneto used with the Ford chassis is very practical. The average battery included in such a system is not, however, of service for lighting, and frequently a lighting system is connected with the magneto.

What has been stated relative to the width of the air gap of the spark plug has been intended to emphasize the fact that care should be taken to have the electrodes of the plugs accurately spaced to obtain maximum efficiency, and that either increase or decrease of the space will materially affect the operation of the engine. The best result is obtained by using a gauge that will give 1/32-inch, and good judgment will dictate setting the electrodes with a piece of metal the exact thickness. The slightest variance from the standard will be manifested in decided change of engine operation. Here should be stated that aside from conditions resulting from wear, the majority of all causes for engine failure may be attributed to lack of knowledge, and the consequent neglect, of the ignition system.

(To Be Continued.)

NEW TIB ROUTE BOOK PUBLISHED.

The third edition of the TIB transcontinental route book, published by the Touring Information Bureau, Shukert Building, Kansas City, Mo., has just come from the press. This is the only route book published that contains the main transcontinental routes in a single volume.

All of the main travelled highways in the United States are covered. These include the National Old Trails Road from New York to Washington, Columbus, Indianapolis, St. Louis, Kansas City, Santa Fe, Los Angeles and San Francisco, the Lincoln Highway through New York, Philadelphia, Pittsburg, Chicago to San Francisco.

In addition the chief routes in the New England states and the main roads from New York City through Albany, Buffalo, Cleveland and

Chicago are given. In the Middle West many important roads, which serve as feeders to the transcontinental routes, have been logged and in most cases strip maps have been made of them. Nearly all the routes in the state of Colorado have been given.

The strip maps employed are drawn on a much larger scale than is usual and they give in the clearest way to the eye complete information concerning the road. It is possible in most cases to follow a route by the use of the maps alone without reference to the printed description. This greatly lightens the mental labor of studying a detailed log and makes it virtually impossible to lose the way.

Some improvements have been made in the admirable strip maps that were features of former editions of the TIB route book. These now show the exact locations and directions of all branching roads and indicate exactly how every turn is made. In mountainous country frequent notations give the motorist exact information as to the altitude, and the population of towns is also noted. The mileage in both directions for each town is given.

The book is indexed very completely so that it is possible to locate information regarding any section very easily. One of its features is a list of official hotels, garages and service stations that have been investigated and are approved by the Touring Information Bureau. In the case of each of these is given the prices charged for storage, oil, and in many cases the price of gasoline, at the time the book went to press.

The logs of the various routes are interspersed with running comment on the scenic, historical, and industrial features of the country, and upon the type of accommodations on which the motorist can depend. The right carburetor adjustment for high altitude is discussed and the Easterner is given advice on the unfamiliar necessity of fording streams, which is frequent in the West. Directions are given for driving narrow mountain roads safely and the motorist is cautioned regarding forest fires and advised on the subject of camping out at night. A satisfactory emergency touring kit is described in detail.

In addition to publishing its transcontinental route book the Touring Information Bureau supplies without charge information on any subject that may be required by tourists. It maps special tours, and supplies facts regarding road conditions.

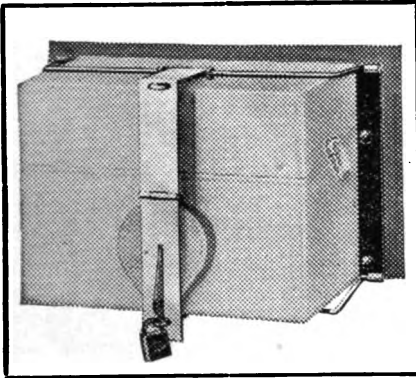
The price of the book is \$2.50.

FORD CAR ACCESSORIES AND EQUIPMENT.

NEW ERA COMBINATION LOCK.

Fool Proof Lock for Ford Switch That Holds Switch Key in Off Position and Secures Box Cover.

To meet the demand of an absolutely "fool proof" switch coil lock for Ford cars, the New Era Spring and Specialty Company, 864-878 Woodward avenue, Detroit, Mich., is manufacturing the device shown in the accompanying illustration.



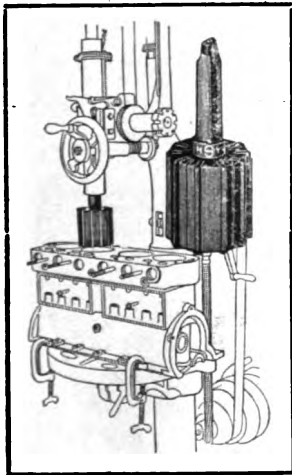
New Era Combination Lock for Ford Cars.

It is designed to fit any Ford car equipped with the metal coil box. The metal straps pass over the coil box and over the switch key as shown. It is obvious that this device absolutely closes access to the coil, it being impossible to even raise the box cover. The top, bottom and side pieces are black enamel, baked, while the front piece is nickel plated and highly polished. The padlock is of a high grade make. Installation is simple and it is not necessary to drill any holes. The lock retails complete at \$1.50.

REAMERS FOR FORD CARS.

Reamer Which Fits Any Drill Press and Rebores Ford Cylinders to 1/32-inch Oversize in 15 Minutes.

Stevens & Co., 375 Broadway, New York City, is manufacturing several types of reamers that are adapted to the various kinds of work to be done on the Ford car. The cylinder reboring reamer shown in the accompanying illustration is designed for reboring the Ford cylinders so that 1/32-inch oversize pistons may be fitted. The tool is constructed with inserted blades having a cutting angle and clearance and requires but little power to operate. A No. 4 Morse taper shank permits the equipment to be used in any ordinary drill press. Statement is made that the Ford cylinder can be accurately rebored in 15 minutes. When dull the blades can be reground and set to the original dimensions at but slight expense. Any special size of body or Morse shank is supplied to order. The tool retails complete at \$16.

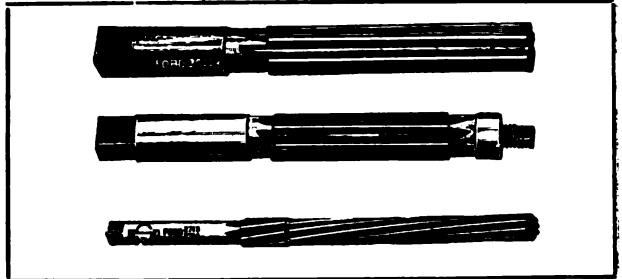


Stevens Cylinder Reboring Reamer.

The Stevens plain and expanding reamers are adapted to a large number of bushings, including those of the differential, steering gear and wrist pin. The expanding type is ground to .005-inch undersize, so that it may be used in conjunction with worn or refinished parts. By turning the screw in at the bottom the cutting blades may be expanded to

.005-inch oversize. Prices range from \$1.50 to \$2.

The Duplex reamer illustrated herewith affords the operator the use of two tools in one, in that it has two



Stevens Plain, Expanding and Duplex Reamers.

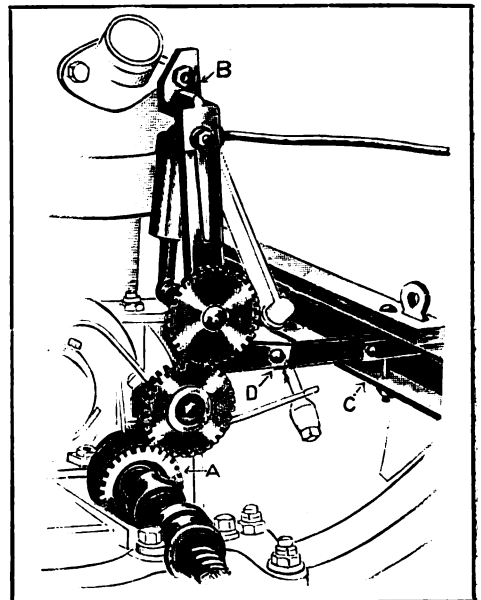
diameters, .564 and .506 of an inch. It is made with both straight and twisted flutes, the latter being especially adapted to split bushings. It is designed for fitting the steering arm and body bushings. The tool retails at \$2.

JULECO "F" PUMP.

Equipment for Inflating Tires Which Can Be Made Permanent Fixture of the Ford Car.

By installing the Juleco "F" pump, manufactured by the Judd & Leland Manufacturing Company, Clifton Springs, N. Y., it is possible for the owner of a Ford car

to enjoy the same convenience when inflating tires that is possible on the most expensive cars. An outstanding feature of this device is that it becomes a permanent fixture on the car, being mounted in a frame behind the fan. It is obvious that this location is advantageous for cooling purposes and, therefore, the pump requires oiling only a few times in a season.



Juleco "F" Pump Assembled on a Ford Car.

When necessary to use the pump, a thumb nut is loosened and the gears forced into mesh. The hose can then be applied. A tire can be fully inflated in about two or three minutes. A whistle gauge announces when the proper pressure has been reached. The driving power is furnished from the forward end of the crankshaft, although it is not necessary to move the fan drive pulley. A split gear fits inside the pulley and is secured by screws. The outfit is sold complete for \$4.50.

ADJUSTABLE FORD WHEEL PULLER.

A Device That Fits to the Wheel Hub Without Danger of Stripping Threads.

The Monarch adjustable wheel puller, made by the Benford Manufacturing Company, Mount Vernon, N. Y., makes the removal of the rear wheel of a Ford car, which is usually keyed on tightly, an easy operation. By being mechanically correct in design, all danger of stripping the thread is eliminated.



Monarch Adjustable Ford Wheel Puller.

In operation, the hub cap and the nut that holds the wheel on the axle are removed, and the device screwed into position. The section that fastens to the hub can be expanded while being put into place, and contracted by tightening a small bolt. This method holds the puller secure and prevents injury to the threads. Removal is effected by turning the central screw against the hub end, which forces off the wheel. The operation is simple and quickly accomplished, and requires but little physical exertion.

The puller is made of malleable iron and is light and convenient to carry in the car's equipment. The retail price is 50 cents.

PARKER SHOCK ABSORBERS.

Indiana Concern Manufacturing Shock Absorbers That Do Not Effect Resiliency of Car Springs.

The Rupe and Kemp Company, 1215 South Franklin street, Muncie, Ind., makes shock absorbers that differ somewhat from the ordinary type in that they do not attach to the spring or offer any restraint to their resiliency.



Parker Shock Absorber, Which Attaches to Car Body and Rear Axle.

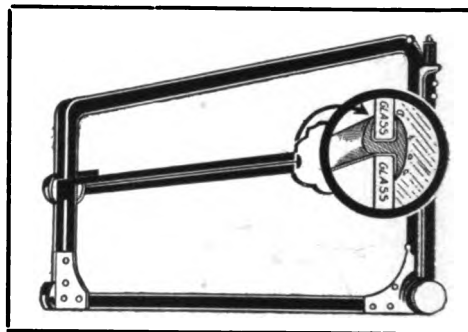
This device is being produced under the trade name of the Parker Shock Absorber, and involves a principle whereby the absorber is fastened to the body of the car and linked by means of a chain to the rear axle. The absorber consists of two oil-tempered coil springs the inner ends of which are attached to a manganese steel frame, this frame being bolted to the body. The outer ends of the springs are secured to a steel shaft on which a rotative lever is located. A block chain attaches this lever to the rear axle, the upper end winding around the shaft as the body approaches the axle. The strong springs of the absorber keep a slight pressure between the body and the axle at all times and, therefore, even the slightest vibration is minimized. The Parker shock absorbers are shipped

in sets of two and are sold with a full guarantee. The ones adapted to cars weighing less than 2400 pounds retail for \$20. Those designed for cars of a greater weight than 2400 pounds sell for \$25. Rupe and Kemp are also manufacturing a special Ford shock absorber, it selling at \$12.50.

THE McCORMICK RUBBER WEATHER STRIP.

This Rubber Strip Closes the Aperture Between Upper and Lower Parts of Storm Vision Windshields.

For the convenience of those motorists who find that rain and snow blow in upon them through the aperture between the upper and lower parts of their storm vision shields, the Robinson Manufacturing Company, 503 Lincoln building, Louisville, Ky., is manufacturing a device which is designed to close the opening tightly.



How McCormick Weather Strip Is Fitted.

It is known as the McCormick weather strip and is fitted onto the upper edge of the lower glass. When the shield is closed the upper glass fits tightly against the rubber surface. It is arranged to be equally tight when the strip is placed on the inside, to allow the upper glass to swing forward freely from the bottom. The strip can be adjusted by a slight pressure of the thumb. When not in use it can be stored in a door pocket or under one of the seats. The retail price is \$1.50 and it is sold on a guarantee to refund the price if it proves unsatisfactory in use.

B-M SWITCH LOCK.

Switch Lock Incorporates a Yale Lock in Its Construction and Provides Absolute Protection Against Theft.

That a Ford car equipped with a B-M switch lock, manufactured by the Bass-Moody Company, Peoria, Ill., and illustrated herewith, is absolutely proof against theft is the statement of the maker. Besides being neat in appearance, it is strongly constructed. The incorporation of a genuine Yale lock in the construction of the device insures high quality of service. A feature of these locks is that there is no duplication of keys. When the switch is locked it is impossible for it to be removed with a screw driver or other tool, as the screw heads are automatically covered with a brass plate. The attachment retails complete with three keys, as shown, at \$3.50, which price includes cost of installation. The manufacturer will gladly supply further information to inquirers, who should mention this magazine when writing.



B-M Switch Lock.

COLE USES LOW-GRADE GASOLINE.

Tests of various grades of gasoline in the Cole eight-cylinder motor made at Pittsburg recently showed that much better results could be had with spirit of low specific gravity, around 50 or 60, than with grades that test from 68 to 70 and sell from four to five cents more per gallon.

The reason is that the high test gasoline when it reaches the float chamber of the carburetor after the motor had been heated up has a tendency to boil, and that sometimes it boils in the feed line to the carburetor. This greatly interferes with carburetion and sometimes stops the motor and makes it necessary to wait until the carburetor cools off.

The low test spirit has a much higher boiling point and for that reason it was used with a great increase in power and mileage. The Cole Motor Company advises its owners to use the cheaper grades of gasoline for reasons of efficiency, as well as economy.

WATTS MAKES LONG TRIP.

F. E. Watts, chief engineer of the Hupp Motor Car Company, recently made a 2235-mile trip through the New England mountains, where the roads were found to have been swept clean of loose dirt by heavy rains and to have a great deal of muddy going. The various notches and passes in the mountains were made in mud, and the climb up Mount Washington was taken after a week of rain. The car averaged 13½ miles per gallon for the trip, notwithstanding the fact that it was driven at high speed whenever road conditions made that safe.

WOODS MOBILETTE USED ABROAD.

The Woods Mobilette, a cyclecar with 36-inch tread, is now in use in nine foreign countries and in every state of the Union. It sells for \$380 fully equipped and is distributed by the International Cyclecar and Accessories Company of Chicago, while the factory is at Harvey, Ill. It is capable of a very large mileage on a gallon of gasoline, reaching 50 miles in many cases.

CHALMERS NEW SALES RECORDS.

During the week beginning Aug. 23, two train loads of Chalmers cars were shipped to eastern dealers, and the first day of the week is characterized by C. A. Pfeffer, vice president and assistant general manager of the company, as the

biggest sales day in the biggest sales months that the company has ever experienced. Inasmuch as July was a record breaker, the August performance is more remarkable. The factory is running night and day on production of the new four with overhead camshaft.

FORD REBATE CHECKS STOLEN.

Profit sharing \$50 checks to the number of 3000, or \$15,000 worth, have been reported as stolen, according to a complaint made to the Highland park police by officials of the Ford Motor Company. Two office employees of the company have been arrested and detectives are on the trail of a third. It is feared that it will be impossible to stop payment on the checks and the capture of the third suspect is the only means of preventing loss to the company.

NEW STUDEBAKER SERVICE PLAN.

Special service for Michigan physicians who use Studebaker cars is being planned by the Studebaker Corporation. In case of break down of the car the doctor has only to notify the service station and his car will be taken there for immediate attention from any point within 25 miles of Detroit, and another machine will be loaned to him for use while his is out of commission.

NEW WIDE TREAD OLDSMOBILES.

To meet the demand of the southern market for a 60-inch tread without making changes in its chassis, the Olds Motor Works has developed a new type of wire wheel, which extends beyond the axle, thus securing the additional width. For the four-cylinder Oldsmobile the price equipped with these wheels is \$1162.50.

NEW YORK CITY TO USE EMPIRE TIRES.

A contract for supplying all the tires used by the New York fire department during the next six months has been granted to the Empire Tire Company, Trenton, N. J. The department already uses large quantities of Empire hose.

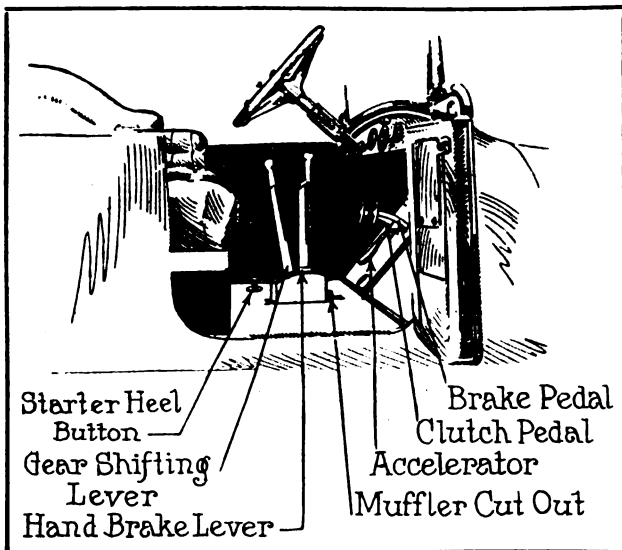
On a 4000-mile automobile trip from Indianapolis to Atlantic City, via Pittsburg, Prof. W. K. Hatt of Purdue university recently got 18 miles per gallon with a 1912 model four-cylinder Marmon car. For the whole trip, including much running in cities, the mileage per gallon was 14 miles.

PRACTICAL FACTS FOR NEW CAR OWNERS

Elementary Instructions in the Economical Operation, Maintenance, Adjustment and Repair of the New Car—Queries—Practical Suggestions.

In response to a large number of communications from new car owners asking for information as to the proper operation, adjustment, maintenance and repair that will give the maximum of service consistent with economy, there will be presented in this department a series of elementary educational articles dealing with the above named subjects. To make this information as complete and informative as possible for all classes of car owners, it has been decided to begin the series at the time the car is purchased and continue until the new owner is thoroughly conversant with all operations. Experienced motorists, as well as the novitiates, will find many valuable suggestions in the various installments, for it is intended to publish such suggestions as have been found practical in years of actual practice.

DRIVING an automobile is an art, in which some people become masters and others mere "dabblers." But, all things being equal, there is no logical reason why all operators can-



Usual Positions of Control Members of a Modern Pleasure Car.

not become experts if they will but give due attention to certain cardinal principles.

When the new car owner takes his automobile out for the first time alone, he almost invariably feels that the instruction given by the expert driver-salesman, which usually covers a period of only a half day, is at best inadequate.

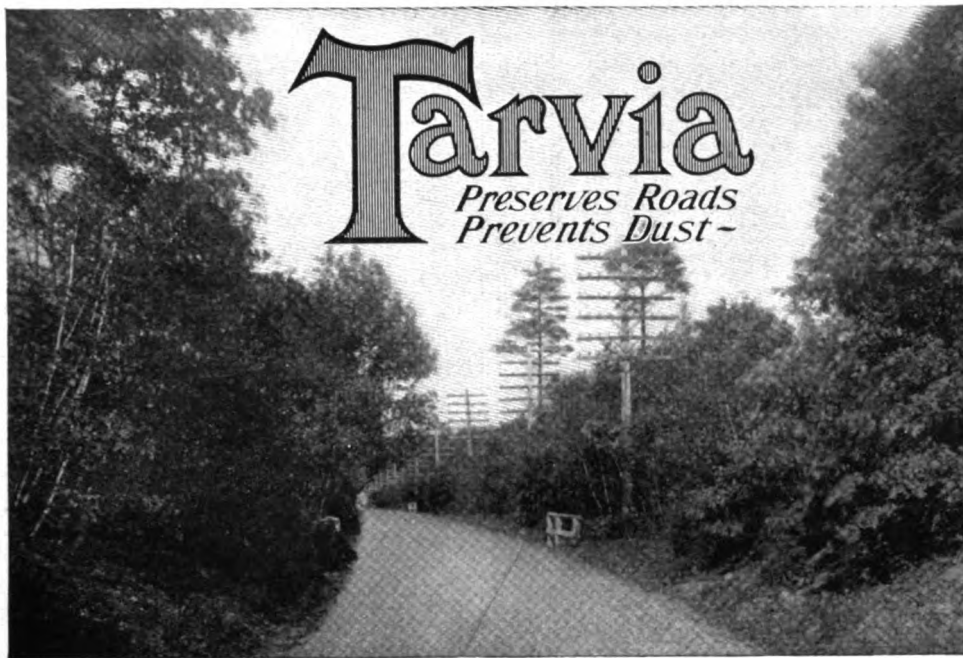
The automobile is not a delicate nor complicated mechanism, but it possesses in its powerful engine a potentiality for damage to life and property that must be guarded against at all times. However, as the new car owner becomes

more accustomed to guiding the machine, he feels a familiarity that soon breeds pleasure—but he never should permit that familiarity breed the proverbial contempt.

Another suggestion, and one of prime importance: **Do not experiment with the new car in highways crowded with traffic! Or in highways where there is any traffic, for that matter.** By "traffic" is meant both vehicles and pedestrians. It is better to select an isolated road. And equally important is the suggestion that the new car driver should practise—not for an hour or for a day, but for several days, until every movement connected with the operation of the car becomes instinctive. Such time spent is not a waste, but is actually an investment, for it will insure that when the emergency does arise the driver will instinctively perform the right operation on the spur of moment and probably save his car from costly damage and himself from serious injury.

One excellent way for the new car owner to learn the proper manner of starting and operating his automobile is to watch the practised driver. He will soon observe that even the elementary act of cranking the motor is an "art"—the expert will turn over the engine seemingly without the least exertion, while the novitiate will labor long and painfully. He will also notice that the expert will make absolutely certain that the gear shifting lever is in neutral, that the emergency brake is securely set, and the ignition switch is turned on battery before attempting to turn the crank. He never takes anything for granted, as some careless persons do, for he knows that carelessness may result in serious accident to himself and others.

The spark lever will be retarded as far as possible and the throttle advanced about one inch. Under no circumstances should it be placed in any other position, whether the car is equipped with a self-starter or not. When the lever is in this position the spark takes place in the combustion chamber when the piston is a little beyond top centre. Once the piston has passed that point the danger of backfiring is past, because it is impossible for the piston to be driven in the reverse direction.



*Mass. State Highway—South Walpole, Mass.
Treated With Tarvia.*

After Six Years—

The Massachusetts Highway Commission in 1909 tried various tentative methods of constructing automobile-proof highways.

One of them was a two-inch macadam top thoroughly cemented together with "Tarvia X".

A section was built by what now would be called rather crude methods at South Walpole on the main trunk highway between Boston and Providence. The state road passes through many towns, residential and manufacturing, which contribute a constantly growing volume of local auto-truck and automobile traffic to the heavy through traffic between the New England capitals.

The road has held its own.

The South Walpole section of highway has always been called by visitors the best section of road between Boston and Providence.

It has stood out in marked contrast to other sections, owing to its smoothness, freedom from mud, and its habit of always being in good condition.

That is a good habit in a road and Tarvia encourages it.

The contrast between this section and other sections is not so marked as it used to be, for in the last few years, as a tribute to the first Tarvia section more Tarvia sections have been built and they are all as good as the first section.

The first cost has been low; the maintenance has been low, and the road has been pre-eminently satisfactory.

Illustrated booklet on request.

Special Service Department

This Company has a corps of trained engineers and chemists who have given years of study to modern road problems.
The advice of these men may be had for the

asking by anyone interested.

If you will write to the nearest office regarding road problems and conditions in your vicinity the matter will have prompt attention.

BARRETT MANUFACTURING COMPANY

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THE COAST LINE TO MACKINAC
 DETROIT, TOLEDO,
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A LAKE TRIP FOR REST AND RECREATION
 Have a real vacation on the Great Lakes, the most enjoyable and economical outing in America. The cool lake breezes, the ever-changing scenes along the shore, and the luxurious steamers of the D. & C. Line are positive guarantees that you will enjoy every minute of your trip, and return home refreshed and glad you went. Daily service between Detroit and Cleveland and Detroit and Buffalo. Four trips weekly from Toledo and Detroit to Mackinac Island and way ports. Two trips weekly, special steamer, Cleveland to Mackinac Island, no stops enroute except Detroit and Alpena. Special day trips between Detroit and Cleveland during July and August. Daily service between Toledo and Put-in-Bay. RAILROAD TICKETS AVAILABLE FOR TRANSPORTATION on D. & C. Steamers between Detroit and Buffalo or Detroit and Cleveland either direction. Send two-cent stamp for illustrated pamphlet and Great Lakes map. Address L. G. Lewis, G.P.A., Detroit, Mich. Detroit & Cleveland Navigation Company Philip H. McMillan, Pres., A. A. Schantz, V.P. & G.M. All Steamers arrive and depart, Third Ave. wharf, Det.




Mea MAGNETOS **S. R. O. BALL BEARINGS**




Sole Importers
MARBURG BROS., 1790 Broadway, NEW YORK

CATARRH---ASTHMA---HAY FEVER
 Bronchitis, etc., are the direct result of germ life—taken into the system through respiration. Immunity from these diseases is simply a matter of protection from germ laden dust. "O-ZEL-O" not only affords absolute protection from dust germs, but positively destroys all germ life which may be present. You breathe its healing, antiseptic vapor for hours at a time—while you work, sleep or play. Price, complete outfit \$2. Let us tell you about it. THE O-ZEL-O CO., Dept. A54, Fort Wayne, Indiana.

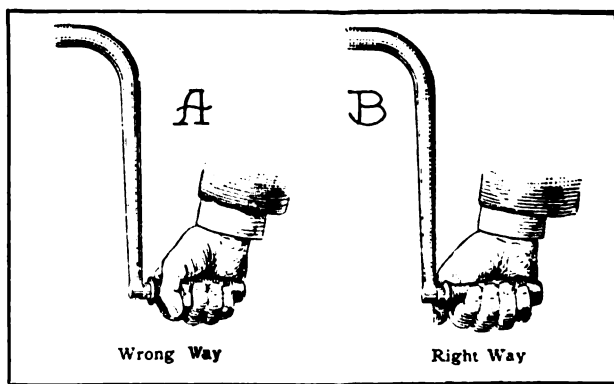


Peerless Quality in Smaller Size
"ALL PURPOSE" FOUR AND SIX
FOUR AT \$2,000 (Sixes \$250 Extra)
THE PEERLESS MOTOR CAR CO., CLEVELAND, OHIO
 Makers also of the "48-Six" and Peerless Trucks.
 Licensed under The Kardo Patents.

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In the case of the throttle lever, it can, on some makes of cars, be advanced further than on others. However, on some machines the large amount of gas thus admitted to the cylinders has a tendency to choke the motor. Practise has shown that the easiest start can be made when the lever is advanced only about an inch, and this is advised by the majority of automobile engineers.

Taking it for granted that the car owner has attended properly to supplying gasoline, water and lubricants, and is sure that the gear shifting lever is in neutral, the emergency brake is set and the ignition switch is turned on battery, he is now ready to start the motor in motion. To digress, it may be well at this time to advise the owner to see that the water he places in the cooling system contains no lime or other injurious minerals. Such minerals under the heat generated by the engine will form scales on the interior of the radiator and cylinder water jackets,



The Wrong and Right Way to Crank Cars.

which will result in the decrease of efficiency of the cooling system by clogging the passages and thickening the radiator walls. Use rain water if possible.

When the motor is to be turned over by a hand crank, the owner should always be wary of a backfire. It should be remembered that an advanced spark is not the only cause for reversing the movement of the pistons. Such a condition may be due to a too rich mixture, to incandescent carbon, grounded wires, etc.

The gripping of the crank handle is a subject that is not given enough serious consideration even by the experienced motorists—until he has met with accident due to his carelessness. Grip the handle with the right hand, having the thumb folded back and away from the fingers. This position will allow the crank to be forcibly "kicked"



Environment


Environment is a basic indication of character, a measure of worth. As a man is judged by his home and his friends so a motor car is measured as to its value by its surroundings of ownership, its social environment.

Scripps-Booth luxurious light cars are become an insistent sight in front of the best homes on Fifth Avenue or in line at the more exclusive receptions, traveling continually in an environment of quality which is a strong convincement of Scripps-Booth superiority.

This environment and quality of ownership gives to the luxurious Scripps-Booth a pride value not obtained heretofore in any light car; making it conspicuously your next motor car purchase.

Scripps-Booth Company
Detroit Mich.

Roadster \$ 775
Coupe 1450



out of the grip without the danger of bending and straining the wrist.

The crank should engage with the end of the crank case at the lowest point of the circle that would be described by a complete revolution of the crank. Give the crank a quick upward pull. This pull should endure for a little less than half a revolution. It is bad practise to continue the pull for the entire revolution. If the engine should backfire the person cranking will stand in danger of broken limbs. Another common practise to be discouraged is the engaging of the crank and crankshaft at the top of the circle and pressing the crank downward. Always pull the crank upward—it is easier, because the average man can lift more than he can push, and it is safer because the body and limbs are out of the danger zone.

For persons of slight strength, the cranking of high compression motors can be simplified by engaging the crank at the lower half of the circle and "rocking" the flywheel. This is done by swinging the crank back and forth. As the flywheel gradually gains momentum, it will not require much strength to pull the crank all the way

up to gain the initial impulse.

If the motor is cool, the first half revolution usually will not start the motor, because the first suction stroke of the piston has not drawn enough gas from the carburetor. On multiple cylinder motors, it may be necessary to repeat the operation three or four times.

As the operator becomes more proficient, he should always do the cranking with the left hand. This will cause him to stand to right side of the crank, where, if the motor backfires, he will instinctively draw away from the flying crank handle. Standing at the left he would be pulled backward and directly into the path of the handle. It is thus that many accidents occur.

The next step is to reduce the gas supply by retarding the throttle lever, and to advance the spark lever slightly. Also change the ignition switch to the point indicated on most cars by the letter M. This breaks the battery circuit and connects with the magneto. The driver is now ready to take his seat at the steering wheel and to set the car in motion, which operation will be described in the next installment.

(To Be Continued.)

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REPAIRS!

A Bitter BILL to Swallow

You can eliminate costly repair bills by systematically lubricating all moving parts of your car (except the engine cylinders) with



NON-FLUID OIL *never fails* to lubricate properly under the hardest conditions of service and your annual expense is less than for other lubricants because NON-FLUID OIL lasts three to four times longer. **Get a can today and prove it.**

"K. No. 99 Special" grade for sliding gear transmission.
"K. No. 999" for differential, compression cups and all bearings.

New York & New Jersey Lubricant Co.,
165 Broadway, New York 1430 Michigan Ave., Chicago



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THE NEW AMSTERDAM

Euclid Avenue at 22nd Street, CLEVELAND, OHIO

A five minutes walk from the active centres, yet overlooking the most beautiful residence section of Cleveland.

"The logical resting place for tired Tourists."

Large airy suites of from two to five rooms (also single rooms.)

GARAGE NEARBY

RATES: — \$1.50 per day, each person
Dining Room Modified *a la Carte*

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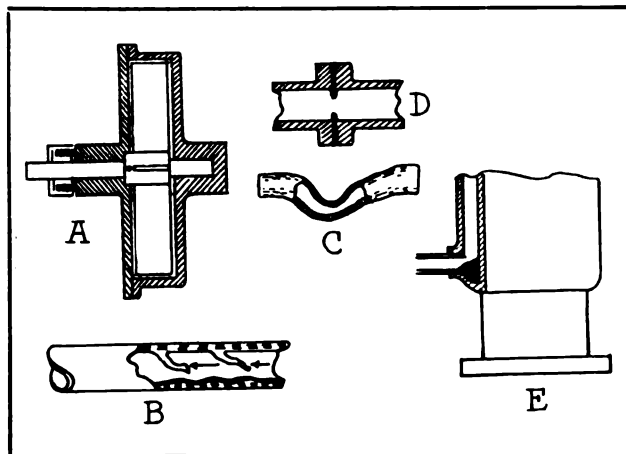
READERS' QUERIES.

Common Causes of Faulty Cooling System, How to Repair a Cracked Cylinder Economically, Home-Made Heater for Carburetor, How to Adjust Rayfield Carburetors.

Faulty Cooling System—H. J. D., Washington, D. C.

I have a car in which the engine overheats. The valves are in good condition, as is also the carburetion and ignition. The water circulation is of a force feed type and the fan is belt driven. Can you suggest the cause?

Are the cylinders free of carbon? If so, the writer would suggest that you examine the water system. The accompanying illustration, A, represents one frequent cause of trouble. The propeller blades may be worn, or the driving pin sheared off. Remove the rubber hose and examine the interior, which sometimes is found to



Five Causes of a Faulty Cooling System.

have deteriorated, as shown at B. Loose plies tend to interfere with the circulation. Ascertain that the hose is not "kinked," as at C. This is a common cause of overheating. Open all joints that have gaskets, which often swell and obstruct the passage, as illustrated at D. As a last precaution, flush out the cylinder jackets with a forceful stream of water, which will remove deposits that sometimes settle at the base of the jacket and choke the water passage, as at E.

Gear Ratio—B. B. G., Camden, N. J.

What is meant by the statement that "the car is geared 3½ to 1"? How is this determined?

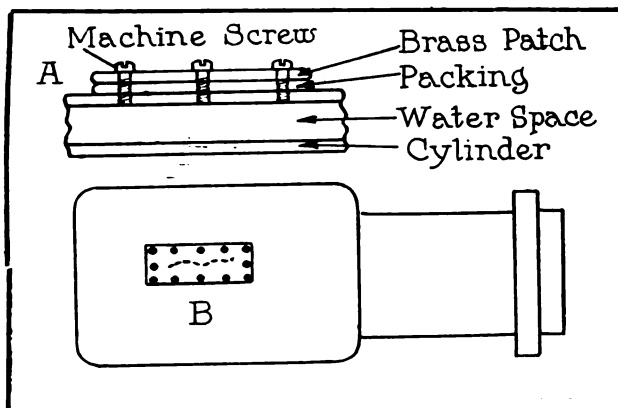
It generally is meant that the master differential gear has 3½ times as many teeth as the driving pinion. If it is considered that the car is in direct drive, no gear reduction taking place in

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the transmission, the crankshaft must complete $3\frac{1}{2}$ revolutions to one of the rear wheels. The gear ratio of your car can be determined by counting the teeth of the master gear and dividing the sum by the number of teeth in the pinion gear.

Repair of a Cracked Cylinder—J. P. G., Woonsocket, R. I.
Is it possible to repair a cracked water jacket without having it welded? I have an old two-cylinder car and do not wish to incur the expense of removing the cylinder. The crack is at the side of the cylinder, and there is ample room for a patch or for soldering. What would you advise?

If you do not mind marring the general appearance of the engine, patching is advisable. Clean part to be repaired thoroughly, and then caulk crack with lead. Apply a liberal amount of white lead to the surface to be covered by the patch and place on it a suitable piece of water packing. Over this fit a brass or copper patch and secure the whole to the cylinder by small machine screws of the 24-thread-to-the-inch type.



Practical Method of Repairing a Cracked Cylinder at Minimum Cost.

Be sure that the screw holes in the cylinder are accurately threaded, and that graphite compound is placed on the threads of the screws before inserting. Shellac the patch on the outside and paint the same color as the cylinder. The completed repair is shown herewith.

Driving to the Right—J. G., Valley Forge, Penn.
Why is it the custom in this country for traffic to keep to the right hand side of the road, while in the majority of foreign countries the rule is the reverse?

History does not record the reason nor when the custom was begun. The only reference at hand bearing on the subject is the statement that the "Massachusetts Mercury," April 11, 1800, published the following:

"A law has been made in Baltimore that the driver of a vehicle with wheels, in passing another in any street, shall keep to the right hand, under

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Don't Gamble With Safety

The brake lining that will afford the best service must be equally efficient until worn through. It must resist heat and not be affected by oil, gasoline, water or dirt.

Your dealer will advise you to buy the best brake lining—that the first cost is no greater and that, measured by service and constant safety, it is the cheapest you can obtain.



Is guaranteed to you to be the best brake lining made. Its quality insures positive protection for life and property. It will afford positive satisfaction in every operating condition. If it does not, the purchase price will be refunded by the dealer. The owner is the judge of quality and results.

Specify S-M-C IMPROVED BRAKE LINING for your car. If your dealer does not have it in stock he can quickly obtain it for you,


**NEW UNIVERSAL
TRANSMISSION LINING FOR FORD CARS**

Special trial set, cut to length, with rivets, price now 50 cents. Regular price 75 cents.

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STAYBESTOS MFG. CO.**
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**HYDRAULIC COMPRESSED
Brake Lining - 100%**

THERMOID RUBBER CO., TRENTON, N. J.

For Perfect Control and Safe, Comfortable Driving use

Weed Anti-Skid Chains

At all Reputable Dealers

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ACCESSORY & GARAGE JOURNAL**

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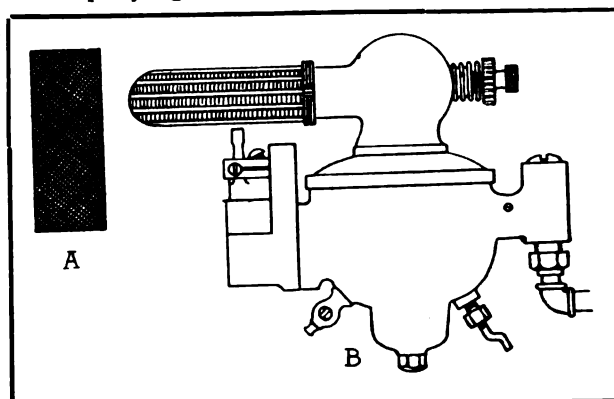
penalty of \$3 for each offense. And likewise a law granting a considerable bounty on the use of broad wheels."

An act establishing a penalty for drivers who failed to keep to the left in England was inaugurated there in 1835 and is known as the Highway Act.

Heating the Carburetor—J. B. L., Norristown, Penn.

I fear that I may experience trouble with my carburetor in cold weather, as no provision is made for supplying warm air. Last winter I had trouble and consulted an expert who stated that some provision should be made for heating the same. I have tried several times to attach a tubing from the exhaust pipe, but do not believe that it can be done. I do not wish to purchase a new carburetor and if you can suggest any remedy that may be of help, it will be greatly appreciated.

Have you tried to place a metal band around the cylinder and run the tubing from this? If a connection cannot be made to any heated part of the motor, place a strip of cardboard at the base of the radiator so as to block the force of cold air directed at this part. The remedy shown in the accompanying illustration may also be of help.



Practical Provision for Heating the Carburetor in Cold Weather.

Form a cage of wire netting, as shown at A. To this cage sew a part of an ordinary cotton stocking, which is very porous. This device can then be clamped to the auxiliary air port, as shown at B. This remedy has been often proved successful.

Inserting Graphite in Cylinders—H. L. T., Laporte, Ind.

I read an article in a recent issue of The Automobile Journal about applying flake graphite to the cylinders to restore compression. Will you advise the best method of applying the lubricant?

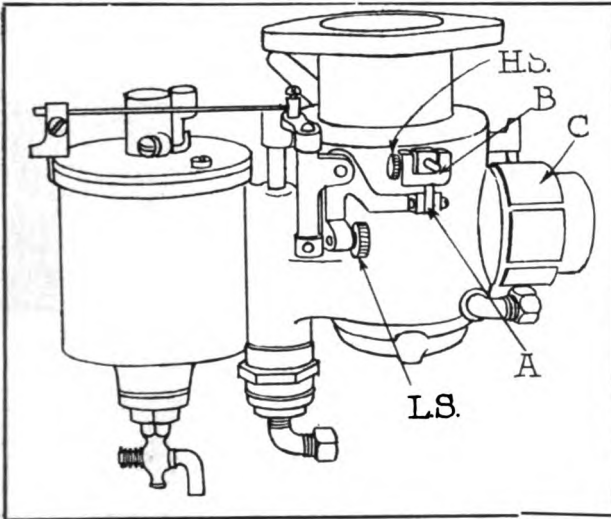
One method is to mix the graphite with the oil in the crankcase, so that it will be thrown upon the cylinder walls by the connecting rod scoops. The second method, and one generally considered the best because of the certainty that the lubricant is on all parts of the walls, is to turn the engine over until the piston of the cylinder to be treated is at the lowest point. Remove the spark plug and blow the graphite into the

cylinder by means of a quill to which is attached a small rubber tube. Of course, if the motor has a removable cylinder head, the graphite can be applied by hand.

Adjustment of Rayfield Carburetor—G. M. P., Philadelphia, Penn.

I have a six-cylinder car equipped with a Rayfield carburetor. I do not know the model, but am told that all Rayfields have the same adjustments. If possible will you state in the next publication of your journal how this make of carburetor is adjusted?

The Rayfield carburetor is made in two models, D and H, the only difference being that the former is water jacketed, while the latter is not. There are two very important factors to be remembered when adjusting this carburetor. First, that all adjustments are turned to the right for a richer mixture, and second, that the automatic air valve requires but light spring tension. Before attempting adjustments, it is advisable



The Adjustment Members of the Rayfield Carburetor.

that you ascertain that there is no obstruction in the gasoline line, that the ignition is perfect, that compression is good and that there are no manifold connection leaks.

Referring to the accompanying illustration, it will be seen that the lower screw, marked L. S., is the low speed adjustment. With the motor throttled to its lowest point, turn the low speed screw to the left until the block, A, slightly leaves contact with the cam, B. The screw should then be turned to the right about $1\frac{1}{2}$ turns. Now open the throttle about a quarter turn and start the motor. After the temperature has risen sufficiently, retard both the throttle and spark levers. The screw should then be turned to the left, one notch at a time, until the motor idles smoothly. If a low enough throttle cannot be obtained, adjustment can be made by turning the

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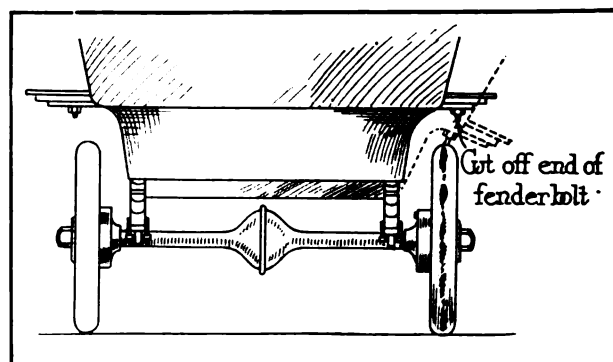
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stop arm screw to the left until the required number of revolutions have been reached.

As a final test for the low speed adjustment press the automatic air valve with the finger. If the motor speeds, the mixture is too rich and must be thinned. This is the low speed adjustment. With the spark lever advanced about quarter way, suddenly snap up the gas lever and note if the engine makes a popping sound or hesitates. This will indicate a lean mixture, and can be remedied by turning the screw marked H.S. to the right until the engine promptly responds to the throttle without backfiring. If a satisfactory adjustment cannot be made in this manner, it may be that the spraying nozzle is too small; a larger one should be fitted. This is the high speed adjustment. Many times, however, when both of the above have been correctly made, the motor will run unevenly at intermediate speeds. This is the result of a lean mixture and to remedy turn the air valve adjustment C to the right. This will increase the spring ten-



How New Fender Bolts May Ruin Tires.

sion on the valve and decrease the air supply. It should be borne in mind, however, that it is well to use all the air that will still afford maximum service.

Tire Trouble—V. W. T., Middleboro, Mass.

The tread of the rear tires of my car have deep cuts in them. I do not operate the machine in the car tracks or suddenly apply the brakes. I had the car overhauled recently and at that time placed new tires on the rear wheels. They have not run over 500 miles since. Can you suggest what the trouble might be?

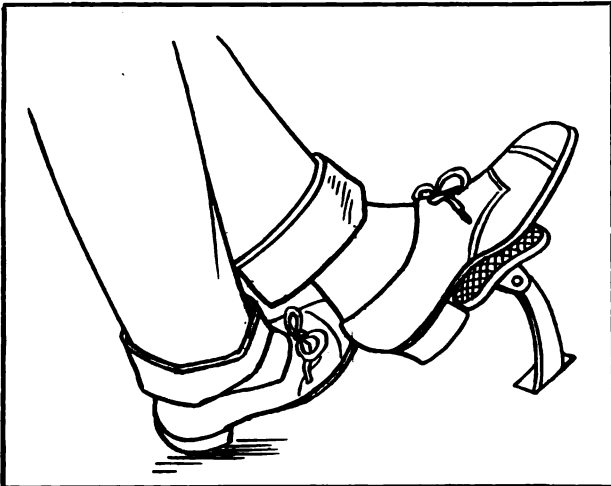
It is possible that new fender bolts were used when your car was overhauled. If these were not cut short the trouble might be as shown in the accompanying illustration. When the car is carrying its full seating capacity the mud guard bracket settles very close to the tire, and as the car passes over the depressions in the road the end of the bolt will contact with the tire. Cut off any projecting end with a hack saw. It will

also be well to smooth the corners of the nuts with a file.

Strong Tension On Clutch—N. C. C., Springfield, Mass.

Being a regular subscriber to your Journal I would like to obtain a little advice. I have a new car equipped with a cone clutch. It is my belief that the spring tension is too great, because if I hold it out for only a brief period, the muscles of my left leg tire and cramp. I had the agent examine the clutch and he stated that if the spring tension was reduced, the clutch would slip. As you may know of others who have overcome this difficulty I will appreciate any advice given.

You do not state whether or not you have been accustomed to sliding gear cars. If not, the tiring of the muscles of the left leg will gradually wear off as you become accustomed to the exercise. Do not use the ball of the foot to depress the pedal, but place the heel of the shoe against the bottom of the pedal, which permits the pressure to be applied wholly by the leg and not by the foot. Another advantage is that the heel acts as a guide, thus preventing the foot from slipping off the pedal. When it is necessary to



How to Relieve Leg Muscles Strained by Constant Use of the Clutch Pedal.

depress the pedal for any considerable period, such as coasting down a hill, the method shown in the accompanying illustration may be found helpful. Place the right foot behind the left, as shown, to afford a rest for the left leg.

PREVENTING HEADLIGHT GLARE.

A common practise among a large proportion of motor car drivers is to suddenly turn out the headlights on country roads when another car is approaching. This is bad policy, for the sudden change from extreme light to extreme dark momentarily leaves the other driver blinded, and consequently proportionately unable to guide his machine.

The better practise is to either equip the car

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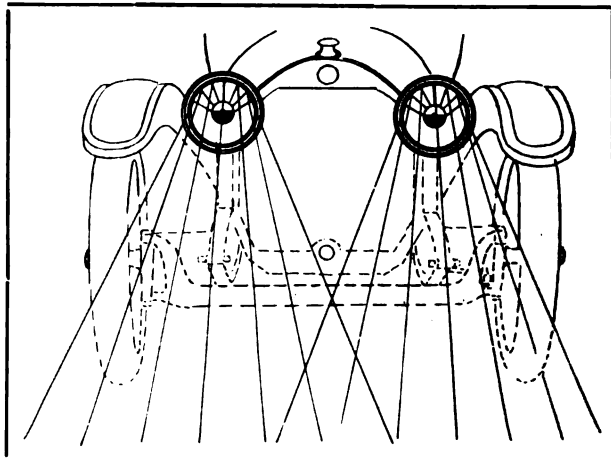
with a dimming device, or to paint the lower half of the electric light bulb with a white opaque paint, which is being done extensively throughout New Jersey. This causes the light rays to be cast to the upper half of the reflector from which it is reflected outwardly and downwardly, thus preventing the glare from striking the eye of a person standing upright, as shown.

If extraordinarily powerful lights are used it is advisable to also paint the front of the bulb, covering an area about the size of a ten-cent piece.

For acetylene lights the same method can be adopted, except that a black substance should be used instead of a white opaque paint.

CLOGGED MUFFLER REDUCES POWER.

Very few motorists seem to realize the necessity of keeping the small passages of the muffler



Proper Focus of Light Rays from Headlight to Avoid Glare in Another Driver's Eyes.

clear. It frequently happens that a car runs smoothly and has a large amount of power, but suddenly the power becomes less and the motor will often miss. This is usually the result of a clogged muffler. Of course there are several types of mufflers, some being effected more than others.

The trouble should generally be expected after using an excess amount of oil, or operating with a very rich mixture. When the holes become clogged, the burned gases cannot be readily ejected and consequently much back pressure is placed upon the exhaust stroke of the piston. It is obvious that the proper method of cleaning the muffler is to disassemble the member, but temporary relief can be obtained by tapping the outer case of the muffler with a light hammer. The

result is that many of the small pieces of soot are loosened and expelled.

HOME MADE PRESSURE TANK.

The conversion of a pleasure car into a racy-type often requires the use of the pressure method of feeding fuel to the carburetor. The ordinary gravity tank can be utilized, if equipped as illustrated. After drilling a hole in the tank filler cap, solder an old tire valve into position shown at A. An ordinary hand pump can be attached to the side of the car, as illustrated at B, and an air line run to the valve in the filler cap. It is a simple matter to conceal the line, which can also be detached readily for feeding gasoline to the tank. A gauge may be attached to the air line if desired.

EFFECT OF EXCESS AIR ON MIXTURE.

A very satisfactory quality apparent in the new car is the ability to throttle down to a few

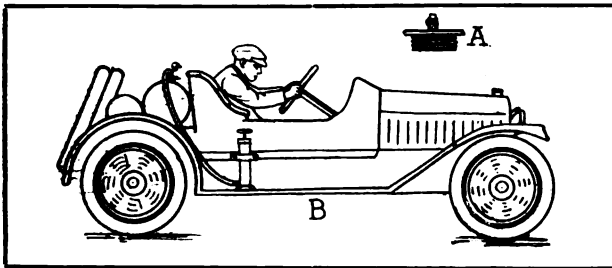


Diagram Showing Position of Pressure Tank and Pump.

miles an hour when in high speed and then almost instantly and always smoothly to resume the original speed. As the car grows older, however, the action frequently becomes jerky, in which case the car owner is prone to condemn the carburetor. This part, however, is not always at fault.

The smooth action of the new car is usually due to the fact that the fuel mixture was received in the combustion chamber in correct proportion. With constant use gradual wear takes place at the point of contact between valve stem and guide. As the mixture is drawn into the cylinder by the suction of the piston, that suction also draws an excess of air through the apertures left by the worn guide, as shown in the illustration at A. The amount of air thus drawn in varies in volume and consequently prevents making adjustment of the carburetor that will give satisfactory results.

Sometimes air is drawn in through loose



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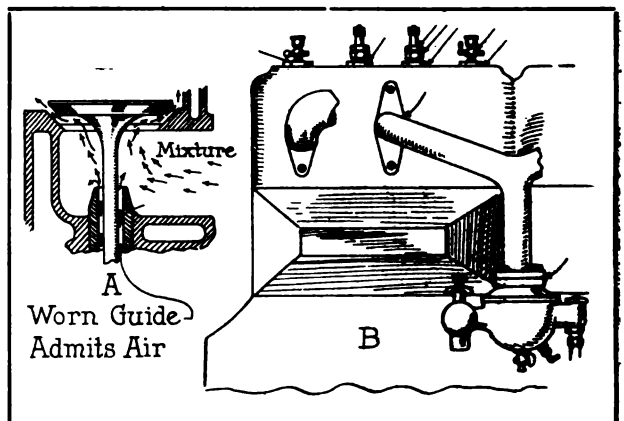
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manifold joints, or through loosely fitted spark plugs, or pet cocks, as indicated by the arrows in the illustration at B.

The remedy for the condition due to worn guide is to replace the bushings, if possible; if not practicable, the guide must be fitted with some kind of an adjustable stuffing box, several types of which are to be found on the market. It is unnecessary to pack the exhaust valve guide, as that valve is closed when the mixture is admitted. Manifold joints can be tightened by coating both sides of the gasket with shellac. The threads of the spark plug and priming cocks should be coated with graphite.

REMOVING GREASE FROM CLOTHING.

An easily made solution that will remove grease spots from clothing can be made by mixing equal parts of ether, ammonia and alcohol.

**How Excess Air Is Sometimes Drawn Into the Mixture.**

Of course, this solution is very inflammable and should be kept away from any naked flame. It should also be placed in air-tight bottles, as it evaporates quickly. It will instantly remove grease spots, however, and is not injurious even to the finest of fabrics.

ADVANTAGES OF OFFSET CYLINDERS.

Many of the earlier makes of cars are equipped with offset cylinders, although there are fewer made at present, except, of course, the eight and 12-cylinder types that have double blocks set at angles. The advantage claimed for this practise is that it is possible for the piston to develop a more direct thrust on the power stroke. It is obvious that when the axis of the crankshaft is directly under the centre of the cylinder, the thrust of the piston on the power stroke is at a

considerable angle. Power is conserved by directing a force on a straight line, and, therefore, this is the principle followed. Of course the angularity is greatly increased on the return strokes, but since the resistance offered is only against compression and exhaust, the thrust is slight compared to the advantage gained on the power stroke.

DON'TS FOR NEW OWNERS.

Don't fill the radiator with water until it reaches the brim of the filler opening, as water expands when hot and will work out through the overflow pipe and threads of the filler cap. Pour the water in the radiator until the level can just be touched with the tips of the fingers.

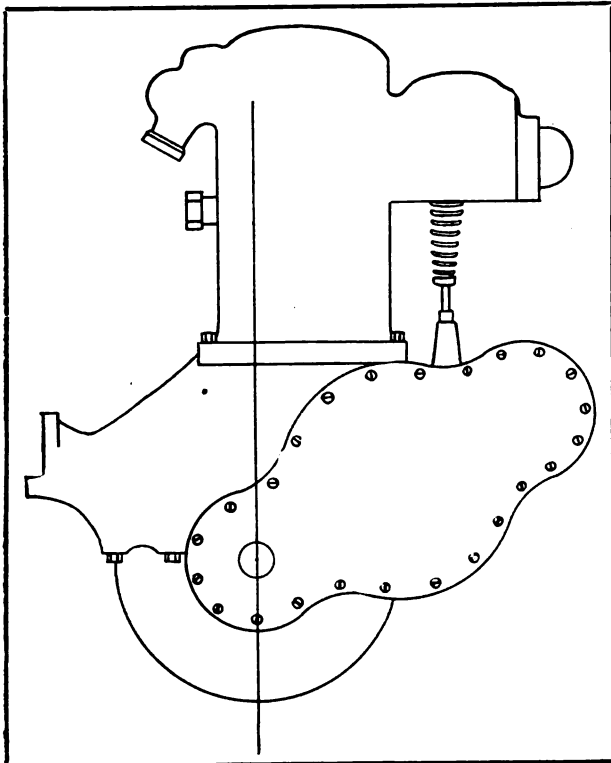


Illustration Showing How Some Motors Have Cylinders Set Off Centre.

Don't pour gasoline into the tank without straining, as small particles of foreign matter and water result in annoying troubles that are sometimes difficult to locate.

Don't crank the car without first ascertaining the position of the spark, throttle and gear levers. Although they may have been left in correct relative positions, yet there is always the liability of somebody changing them during the owner's absence. Even when the self starter is used, it should be noted that the gear lever is in neutral.

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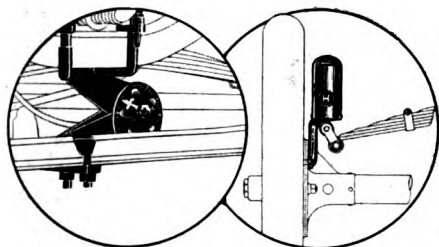
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Controlled spring action at the front, greater resiliency at the rear. Result—real big-car comfort.



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The Hartford Comfort Combination makes every road a boulevard for Ford owners. At front, where the greater weight is, the HARTFORD SHOCK ABSORBER prevents violent movement of the front springs; at rear, where less weight is, two HARTFORD CUSHION SPRINGS supply the needed resiliency.

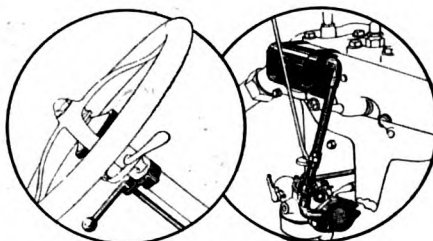
Try this combination. It's a comfort maker.

Price { One Hartford Shock Absorber { **\$12**
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Is a Saving of 35% in Gasoline a Consideration?

If so, get acquainted with a Ford accessory that cuts down your "gas" bills over one-third, gives greater power to your engine, makes it run more smoothly. The HARTFORD ECONOMIZER feeds more air and less gas to a Ford engine, furnishing an ideal mixture. It's a genuine economizer and its price is exceedingly low—

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HARTFORD ECONOMIZER



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enhancing its good looks while protecting lamps, radiator, mudguards and car. That's why a HARTFORD BUMPER is the best bumper for a Ford. • It is shock-absorbing. When something hits its bump bar the force of the collision is dissipated by friction leaves of spring-steel. All your Ford is saved from harm. Bolts on without drilling.

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VOL. XL.

SEPTEMBER 25, 1915.

NO. 4.

PUBLISHER'S AND READERS' PAGE.

SUBSCRIBERS Requesting information regarding the care, repair and operation of the automobile and its components, should always make certain that they have given in their letters the make, the model and all the other necessary details concerning the particular car or part in question. This caution is made necessary by the fact that a surprisingly large proportion of the letters received omit to give these essential data; consequently the Editor of the Mechanical Department is often unable to give a satisfactory answer. By heeding this suggestion inquirers can save considerable trouble for the editor and can obtain for themselves the maximum of service.

If Any Reader Desires Special Information regarding articles made by manufacturers of accessories, machinery and tools for the garage, car attachments and motor vehicles, whether the advertisements of those manufacturers are seen in this magazine or not, the editor will be glad to promptly give such information upon request. The name and address of the manufacturer, the price of the article, as well as a complete description of it, will be presented in the magazine department devoted to the respective subjects, or will be sent by personal mail, which ever the inquirer desires. The Editorial Department maintains one of the largest manufacturing data libraries in the country for that purpose, and it is kept up to the highest point of efficiency for the especial benefit of subscribers.

The Attention of Subscribers is directed to the set of hand books of mechanical subjects issued by The Automobile Journal Publishing Company. These contain thousands of accurate illustrations and not only describe the construction and operation of every component of motor vehicles, but give complete and readily understandable instructions for locating and remedying troubles. Each book is thoroughly cross-indexed, which makes the series very convenient for use as reference books. This library of mechanical information will make the car owner practically independent

of the repair shop. That they are eminently reliable is vouched for by the fact that they are being used in several technical colleges and schools as instruction books. For further information address the Publisher of The Automobile Journal.

Requests for Sample Copies of The Accessory and Garage Journal were more numerous than usual during the past fortnight, and that fact induces the Publisher to explain through these columns that that magazine is wholly an "industrial newspaper," circulating through every state in the Union among dealers and jobbers, proprietors of public garages and service stations, and manufacturers and repair men. Among its several departments that thoroughly review every interest in the motor vehicle and allied industries, is a department wherein is presented each month more complete editorial descriptions and illustrations of garage tools and machinery, accessories, parts, etc., than any other magazine of its kind in the country.

Partial Table of Contents.

	Page
*Big Crowd at Providence Race.....	9
*Motor Starting and Lighting.....	15
*General News of the Industry.....	21
*Short Lived Leather Upholstery.....	25
Motor Car a Saver on Rural Routes....	28
*Great Western Light Six.....	29
*Elco "30" Sells at \$585.....	32
Resta Makes 108 Miles Per Hour.....	33
*Practical Motor Car Repairs.....	34
*KisselKar Line Includes 14 Bodies....	36
*Reo Makes No Radical Changes.....	39
*Car Accessories and Equipment.....	41
*Tools and Equipment for Garages.....	43
*Industrial Happenings and Comment...44	
*Suggestions for the Ford Car Owner...45	
*Ford Car Accessories and Equipment...48	
*Practical Facts for New Car Owners...51	

*Indicates article is illustrated.

Inquiries on the Subject of Touring continue to arrive by the hundreds, which seem to indicate that though autumn did officially arrive at 10:16 p. m. Sept. 23, a larger proportion of motorists is planning to keep the car in operation longer this year than in the past. It is noticeable, however, that the direction of tour in the northern tier of states has swung half way round the compass—the southland is now the objective of many tourists. The Touring Editor wishes to call to the attention of motorists that at this season of the year the country districts of the northern states are more beautiful and healthful than at any other—the leaves on trees and shrubs are assuming their autumnal colors, and the air is exhilarating and invigorating. Those desiring information regarding tours north of the Mason and Dixon line, as in any other part of the country, can obtain it promptly by addressing the Touring Editor, who will continue to make his department the big success it has proven to be.

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Index to Advertisers.

	Page
Ahlberg Bearing Co.....	62
Barrett Manufacturing Co.....	54
Bosch Magneto Co.....	55
Boyd, F. Shirley.....	52
Coes Wrench Co.....	3
Culver Stearns Mfg. Co.....	52
Dixon Crucible Co., Jos.....	60
Dover Stamping & Mfg. Co.....	59
Eagle Oil and Supply Co.....	4
Eisemann Magneto Co.....	60
Goodyear Tire and Rubber Co.....	62
Harris Oil Co., A. W.....	54
Hartford Mach. Screw Co.....	63
Hartford Suspension Co.....	1
Heinze Electric Co.....	56
Hotel New Amsterdam.....	57
Hotel Tuller.....	60
Inter-State Motor Co.....	56
Marburg Bros.....	55
McQuay Norris Mfg. Co.....	56
Mea Magneto Co.....	55
Mecca Mfg. & Spec. Co.....	4
Metz Company.....	59
New Amsterdam Hotel.....	57
New Departure Mfg. Co.....	57
Nordyke & Marmon Co.....	59
N. Y. & N. J. Lubricant Co.....	57
O-Zel-O Company, The.....	55
Peerless Motor Car Co.....	55
Pierce-Arrow M. C. Co.....	Cover
Primm & Emmerson.....	4
Scripps-Booth Co., The.....	53
Spltdorf Electrical Co.....	52
Springfield Metal Body Co.....	Cover
Standard Oil Co., The.....	61
Staybestos Mfg. Co., The.....	59
Stutz Motor Car Co.....	5
Superior Mfg. Co.....	52
Texas Oil Co.....	Cover
Thermoid Rubber Co.....	56
Times Square Automobile Co.,	4
Tuller Hotel.....	60
Valvoline Oil Co.....	60
Vanderpool Co., The.....	4
Weed Chain Tire Grip Co.....	8

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The advertisement is framed by a large, ornate oval border. At the top, the word "STUTZ" is written in large, bold, serif capital letters, with a decorative banner below it reading "SUPREMACY". Above the "STUTZ" text are two circular portraits of men wearing racing helmets and goggles. Below the "SUPREMACY" banner, the word "STAMINA" is written in large, bold, serif capital letters, underlined. Below "STAMINA", the text reads: "American Design and Construction Vindicated at Minneapolis, Minnesota, September 4th, 1915". Further down, it says: "When two STUTZ cars were entered and finished first and second, less than a car length apart (1-5 of a second).". Below this, in italics, it reads: "Beating every Foreign Car entered and establishing American Superiority". The company name "STUTZ MOTOR CAR COMPANY" is written in large, bold, serif capital letters, followed by "INDIANAPOLIS, INDIANA" in smaller, bold, serif capital letters. At the bottom of the advertisement is a detailed illustration of a Stutz open-top motor car, shown from a side profile, facing right. The car has large spoked wheels, a high chassis, and a steering wheel.

STUTZ

SUPREMACY

STAMINA

American Design and Construction Vindicated
at Minneapolis, Minnesota,
September 4th, 1915

When two STUTZ cars were entered and
finished first and second, less than a car
length apart (1-5 of a second).

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and establishing American Superiority*

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Faw, J. H., Inc., 41 Warren St., New York City.
Times Square Auto Co., 56th St., at Broadway, New York City.

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Brunner Mfg. Co., Main Office and Factory, Utica, N. Y.; New York Office, Hudson Terminal Bldg., 30 Church St. (Brunner.)
Williams Foundry & Machine Co., Akron, O.

AIR PUMPS.

Gardiner Governor Co., 126 Williamson St., Quincy, Ill.
Lipman Air Appliance Co., 199 Pleasant St., Beloit, Wis. (Portable, Stationary.)

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Gemco Mfg. Co., 743 So. Pierce St., Milwaukee, Wis.

AUTOMOBILES. (See Cars.)

AUTOMOBILE SPECIALTIES.

Motor Specialties Co., Waltham, Mass.

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Russel Motor Axle Co., North Detroit, Mich. (Internal Gear Drive.)

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New Departure Mfg. Co., Bristol, Conn. (New Departure.)

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Staybestos Mfg. Co., Lena and Armat Sts., Germantown, Philadelphia, Penn. (Staybestos.)

Thermoid Rubber Co., Trenton, N. J.

BRUSHES, WIRE.

Williams Foundry & Machine Co., Akron, O.

CABLE, AUTOMOBILE.

Faw, J. H., Inc., 41 Warren St., New York City. (Standard American.)

Packard Electric Co., The, Warren, O.

CARBON REMOVERS. (See Cylinder Cleaning Compound.)

CARBURETORS.

Air-Friction Carburetor Co., Dayton, O. (Model C.)

Zenith Carburetor Co., Detroit. (Zenith.)

CARS—GASOLINE PLEASURE.

Inter-State Motor Co., 804 West Willard St., Muncie, Ind. (Inter-State.)

Metz Co., Waltham, Mass. (Metz.)

Nordyke & Marmon Co., Indianapolis. (Marmon.)

Peerless Motor Car Co., Cleveland, O. (Peerless.)

Pierce-Arrow Motor Car Co., Buffalo, N. Y. (Pierce-Arrow.)

Scripps-Booth Co., Detroit. (Scripps-Booth.)

Stutz Motor Car Co., Indianapolis. (Stutz.)

White Co., Cleveland, O. (White.)

Willis-Overland Co., Toledo, O. (Overland.)

Winton Motor Car Co., 131 Berea Road, Cleveland, O. (Winton.)

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Chase Motor Truck Co., 106 West St., Syracuse, N. Y.

Duplex Power Car Co., Charlotte, Mich. (Duplex.)

Federal Motor Truck Co., Junction and Leavitt Sts., Detroit. (Federal.)

General Motors Truck Co., 26 Cadillac Ave., Pontiac, Mich. (GMC.)

Independent Motors Co., Port Huron, Mich. (Independent.)

Jeffery Co., Thos. B., Kenosha, Wis.

Kissel Motor Car Co., 196 Kissel Ave., Hartford, Wis.

Packard Motor Car Co., Detroit, Mich.

Peerless Motor Car Co., Cleveland, O. (Peerless.)

Pierce-Arrow Motor Car Co., Buffalo, N. Y. (Pierce-Arrow.)

Sanford Motor Truck Co., Syracuse, N. Y. (Sanford.)

Signal Motor Truck Co., Detroit. (Signal.)

Sullivan Motor Car Co., Rochester, N. Y. (Sullivan.)

White Co., Cleveland, O. (White.)

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General Vehicle Co., Long Island, N. Y.

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Motor Accessories Inc., 749 A Boylston St., Boston. (Chain-Lub.)

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Pierce Speed Controller Co., Anderson, Ind.

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Housel Sales Co., B Street, Buffalo, N. Y.

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Dover Stamping & Manufacturing Co., Cambridge, Mass. (Dover.)

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Gearless Differential Co., 364 Woodward Ave., Detroit, Mich.

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Detroit Radiator Spec. Co., 961 Woodward Ave., Detroit, Mich.

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JACKS.

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Hawthorne Mfg. Co., Inc., 5 Spruce St., Philadelphia, Penn. (Spotlights, Marine Searchlights, Pencil Flashlights.)

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Dixon Crucible Co., Jos., Jersey City, N. J. (Graphite.)

Eagle Oil & Supply Co., 104 Broad St., Boston. (Eagleline No-Karbon.)

Harris Oil Co., A. W., 326 So. Water St., Providence, R. I.; 143 No. Wabash Ave., Chicago. (Harris.)

New York & New Jersey Lubricant Co., 165 Broadway, New York. (MotoRol, Non-Fluid, Kejex.)

Standard Oil Co., New York. (Polarine.)

Texas Company, 17 Battery place, New York City. (Texaco.)

Vacuum Oil Co., Rochester, N. Y. (Gargoyle Mobiloil.)

Valvoline Oil Co., 27 State St., Boston. (Valvoline.)

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Heinze Electric Co., Lowell, Mass.

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Bosch Magneto Co., 223-225 W. 46th St., New York.

Eisemann Magneto Co., 32 3rd St., Brooklyn, N. Y. (Eisemann.)

Marburg Bros., 1790 Broadway, New York. (Mea.)

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McQuay-Norris Mfg. Co., Dept. D, St. Louis, Mo. (Leak-Proof.)

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Hill Pump Valve Co., Chicago, Ill.

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Rome-Turney Radiator Co., Rome, N. Y. (Helical Tube.)

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RADIATOR & HOOD COMBINATIONS.
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Hyatt Roller Bearing Co., Detroit. (Hyatt.)

Norma Co. of America, 1790 Broadway, New York City. (Norma.)

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Auto Parts Co., Dept. T, 737-739 W. Jackson Blvd., Chicago, Ill. (Racing.)

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Hartford Suspension Co., 147 Morgan St., Jersey City, N. J.

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Faw, J. H., Inc., 41 Warren St., New York City. (Red Seal.)

Gibson-Hollister Mfg. Co., Boston, Mass.

Hartford Machine Screw Co., 512 Capitol Avenue, Hartford, Conn. (Master.)

Heinze Electric Co., Lowell, Mass.

Milwaukee Auto Specialty Co., 705-711 Chestnut St., Milwaukee, Wis. (Centerfire.)

Splitdorf Electrical Co., 98 Warren St., Newark, N. J.

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SPRINGS FOR AUTOMOBILE SUSPENSION.

Marburg Bros., Inc., 1790 Broadway, New York. (Marburg-Hagen.)

Tuthill Spring Co., 756 Polk St., Chicago. (Titanic Unbreakable.)

SPROCKETS.

Boyd, F. Shirley, 175 Massachusetts Ave., Boston. (Baldwin.)

TEST CLIPS.

Mueller & Co., R. S., 431 High Ave., S. E., Cleveland, O. (Universal.)

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Dover Stamping & Manufacturing Co., Cambridge, Mass.

TIMERS.

Motor Specialties Co., Waltham, Mass. (Bemus.)

WHEELS, WIRE.

Hoggson & Co., S. H., Thames Bldg., New York, N. Y.

Houk Mfg. Co., 1709 Elmwood Ave., Buffalo, N. Y. (Houk Detachable.)

TIRE CHAIN GRIPS. (See Chains.)**TIRES, CASINGS AND INNER TUBES.**

Federal Rubber Mfg. Co., Milwaukee, Wis. (Federal.)

Goodyear Tire & Rubber Co., Madison St., Akron, O.

Polack Tyre & Rubber Co., 246 W. 59th St., New York City. (Polack.)

TIRE TOOLS.

Housel Sales Co., B Street, Buffalo, N. Y.

TOPS AND ATTACHMENTS.

Highland Body Manufacturing Co., Station P, Cincinnati, O. (Highland Coupe.)

Springfield Metal Body Co., 20 Medford Ave., Springfield, Mass.

TRACTORS.

Knox Motors Associates, Springfield, Mass. (Knox.)

TRANSFORMERS.

Packard Electric Co., The, Warren, O.

TRUCKS AND TRACTORS. (See Cars, Commercial.)

VALVE GRINDING COMPOUND.

Faw, J. H., Inc., 41 Warren St., New York City. (Eureka.)

VALVE TOOLS.

American Valve Tool Co., 589 Hudson St., New York, N. Y.

VIBRATORS.

J & B Mfg. Co., Pittsfield, Mass.

VULCANIZERS.

Mabey's Electric & Mfg. Co., Indianapolis. (Mabey's Electric.)

Vanderpool Co., Springfield, O.

Williams Foundry & Machine Co., Akron, O.

WARNING SIGNALS.

Seles Mfg. Co., 444 Dorr St., Toledo, O.

WELDING OUTFITS.

Dyer Apparatus Co., Cambridge, Mass. (Dyer.)

Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill. (Oxyacetylene Combination Outfit.)

Searchlight Co., 1012 Karpen Bldg., Chicago, Ill.

Waterhouse Welding Co., 3 Pelham St., Boston, Mass.

WRENCHES AND COMBINATION OUTFITS.

Coes Wrench Co., Worcester, Mass.

Faw, J. H., Inc., 41 Warren St., New York City. (Walden.)

Lane, Will B., 180 No. Dearborn St., Chicago. (Unique Ratchet.)

Mossberg Co., Frank, Attleboro, Mass.

Walden Mfg. Co., 73 Commercial St., Worcester, Mass.



It May Happen to Yours
 —whirled on skidding tires
 into a disastrous crash

Stop endangering your life as well as the lives of others. When streets are wet, always "chain your car to safety." Take no chances. Equip all four tires with

Weed Anti-Skid Chains

The ONLY Positive Safeguard Against Skidding

Safety demands that all tires be equipped with Weed Chains. It doesn't require the gift of second sight to see why this is true. Rubber slips—never grips. It slides on wet pavements and roads like a cake of soap on the moistened hands.

Rubber lacks the bite-and-hang-on ability to prevent skidding, while Weed Chains hold on like a bull dog, prevent side-skid and drive slip. Equip both front and rear tires with Weed Chains. Do it today—before it's too late.

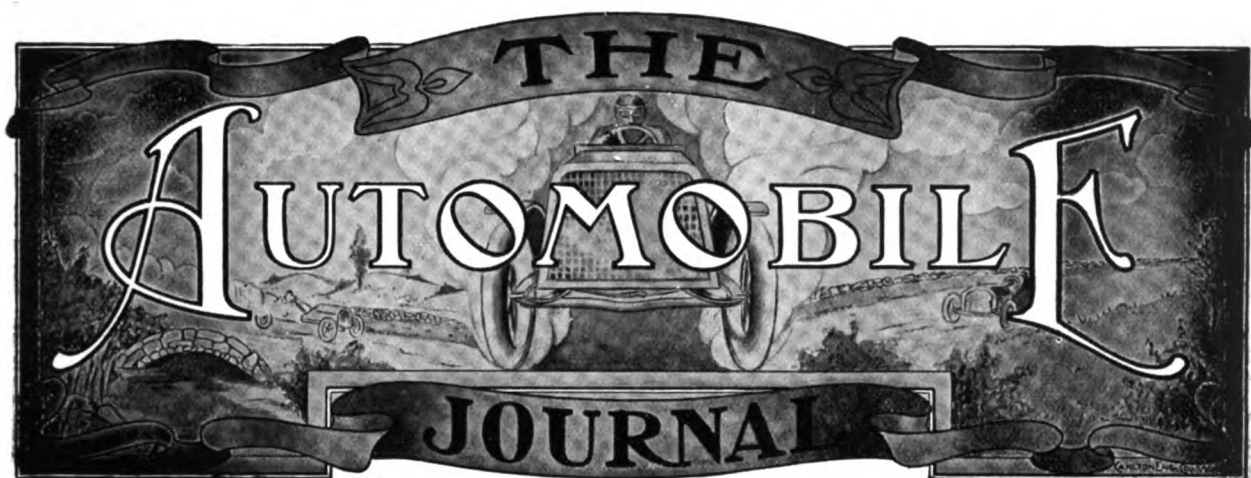
SOLD FOR ALL TIRES BY DEALERS EVERYWHERE

Weed Chain Tire Grip Company, . . . Bridgeport, Conn.

Also manufacturers of Motorcycle Tire Chains and Dobbins Blow-Out Chains



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VOL. XL, No. 4

SEPTEMBER 25, 1915

Price, \$1.50 the Year

BIG CROWD AT PROVIDENCE RACE.

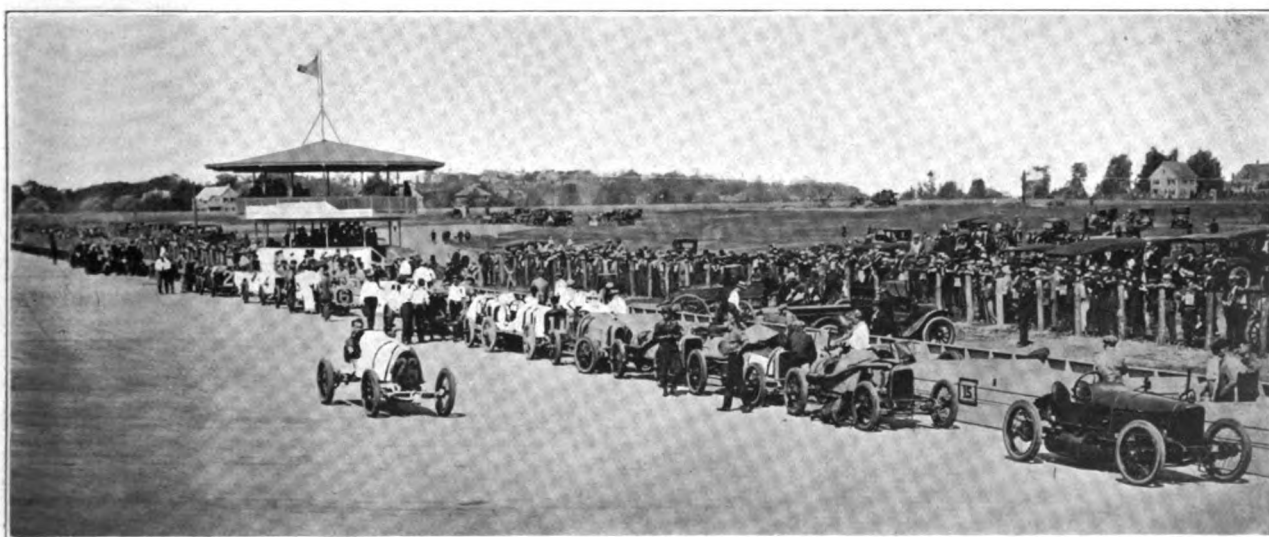
Much Enthusiasm Shown at Narragansett Park Although the Race Was Slow, Rickenbacher Winning at 67 Miles an Hour.

THERE was a record breaking crowd for a motor race in New England at the Narragansett Park Speedway in Providence, Sept. 18. It displayed great enthusiasm over the sport, notwithstanding the fact that the construction of the one-mile track prevented a speed in excess of 67 miles an hour.

Eddie Rickenbacher, in a Maxwell, won the

100-mile race, which was the leading event, in 89:24:75, with Burman, in a Peugeot, second; Willie Haupt, in a Duesenberg, third, and Ralph De Palma, in a Stutz, fourth.

In view of recent accidents on some of the one-mile tracks, and the fact that most of the drivers will appear at the opening of the Sheepshead Bay Speedway in New York City on Oct.



Waiting for the Starter's Flag at Narragansett Park—View Showing the Contestants Lined Up at the Pits, and a Small Portion of the 30,000 Spectators.

2, the driver's were generally conservative.

With the exception of Rickenbacher, who showed a willingness to take



Frederick E. Perkins, President of the Narragansett Park Speedway and Promoter of the Race.

more chances than any of the others, practically all the drivers shut off their motors and coasted about the turns. These are banked at 31 degrees, which, in view of the angle of the turns, proved to be insufficient to make high speed around them possible. The track at the bends is also rather narrow.

Rickenbacher's success was won notwithstanding the fact that he lost about three minutes at the pits for tire and motor repairs. During that time his rivals gained three laps of the track. He made that up and succeeded in gaining one additional lap before the end of the race.

Rickenbacher Is Daring.

The Maxwell star maintained his reputation for daring and recklessness by driving the turns at the greatest speed consistent with safety, and at times his car seemed to shoot along not more than three or four inches from the rail. All of the

time he made up was on the turns, where Burman and De Palma prudently shut off their motors and allowed their cars to coast.

It is probable that the defects in the track's construction will be eradicated before the next meet is held and then much better time can be expected. As it was, a crowd of between 20,000 and 30,000 people were present and as the lowest priced seat was \$1, the promoters are understood to have made a fine margin over the \$11,000 offered in prizes and the expenses of the meeting. The event showed conclusively that motor racing is a very live sport in New England and has

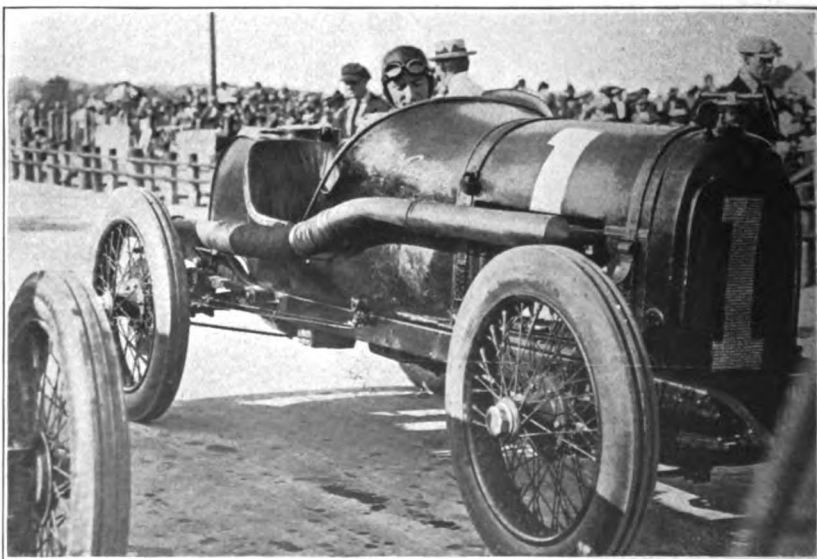
RESULTS OF 100-MILE RACE.

1. Rickenbacher, Maxwell Special	89:24.75	\$4000
2. Burman, Peugeot	91:21.55	2000
3. Haupt, Duesenberg	91:24.25	1000
4. De Palma, Stutz	91:42.70	700
5. Henderson, Duesenberg	92:25.35	600
6. Meyers, National	93:42.50	400
7. Vail, Mulford	95:36.25	300
8. Cleary, Bugatti	96:50.40	..

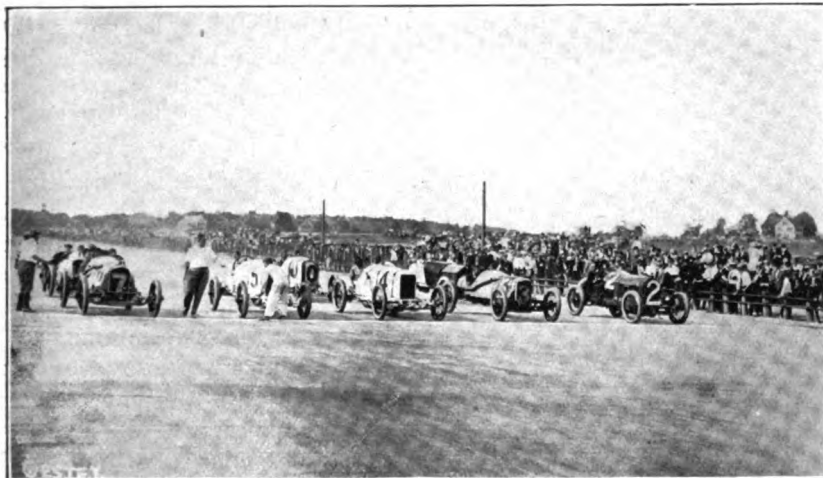
an excellent future.

Narragansett park was in its day one of the famous horse racing tracks of the country. It was built in 1866 by Col. Amasa Sprague, brother of the late William Sprague, Rhode Island's only Civil War governor. It was opened for trotting races in 1866 with the greatest possible enthusiasm on the part of horse racing enthusiasts throughout the country. Commodore Cornelius Vanderbilt entered his horses there and attended the meets.

The handsome gates that were built 50 years ago are still over the entrance to the park, and



Winner of the 100-Mile Race, Eddie Rickenbacher, Mounted in the Maxwell Which He Piloted to Victory, Making the Distance in 89½ Minutes.



The Start of the 25-Mile Free-for-All Non-Stock Race, Showing Bob Burman, the Winner, No 2, Hugging the Rail.

of the first American motor races was held here in 1896, when there was a "horseless carriage" race for a purse of \$5000. This, in fact, was the third race of the kind in America, the first having been the Chicago Record event, and the second a race from New York to Ardsley and return.

Five Days of Racing.

On that occasion the programme was arranged so that the "horseless carriages" were to race every day for five days for \$1000 each day. Skepticism and amusement greeted the cars at that time. Seven Duryea cars were entered and five start-

the main grandstand is the same. Otherwise the track has been much altered. Horse racing was continued and in 1880, when the Rhode Island Society for the Encouragement of Domestic In-

ed. The starter sent them off with the words, "Now go—if you can!"

London and Paris papers and the scientific papers of the country were represented in the press boxes. Of the 12 carriages entered, eight appeared and seven started. Two of them were electrics. They were expected to show 15 miles an hour, but only three made that speed.

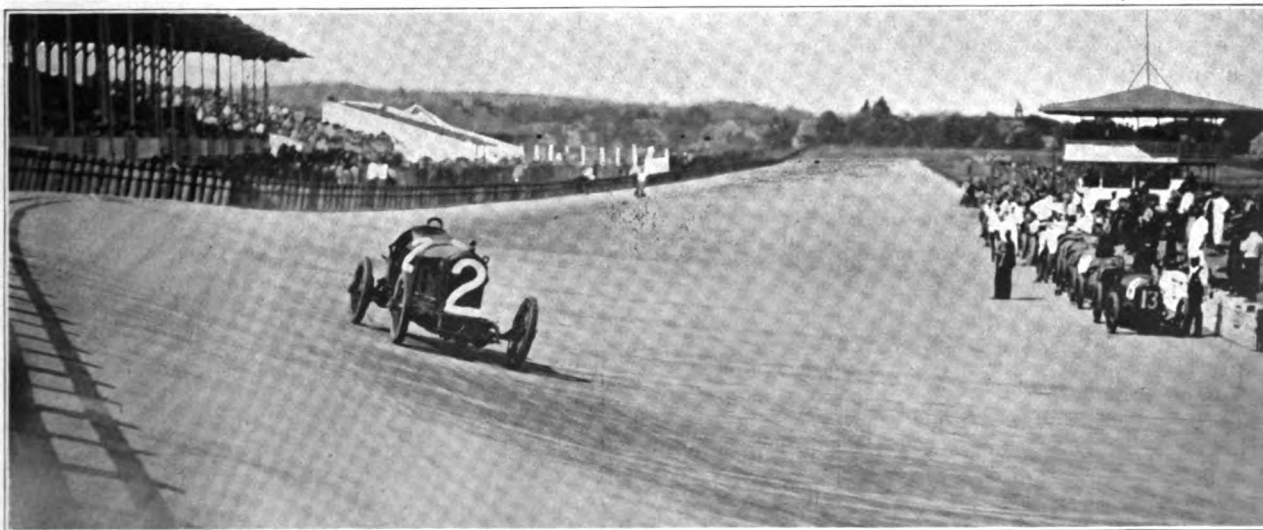
A car entered by the Riker Motor Company, of which A. L. Riker, now vice president of the Locomobile Company of America, was the head, won the race, making the five miles in 15 minutes. The second car was also an electric and the three others that placed were Duryea gasoline cars. The cars were often referred to as "motorcycles" and the drivers called "motormen."

ONE-HOUR MOTORCYCLE RACE.

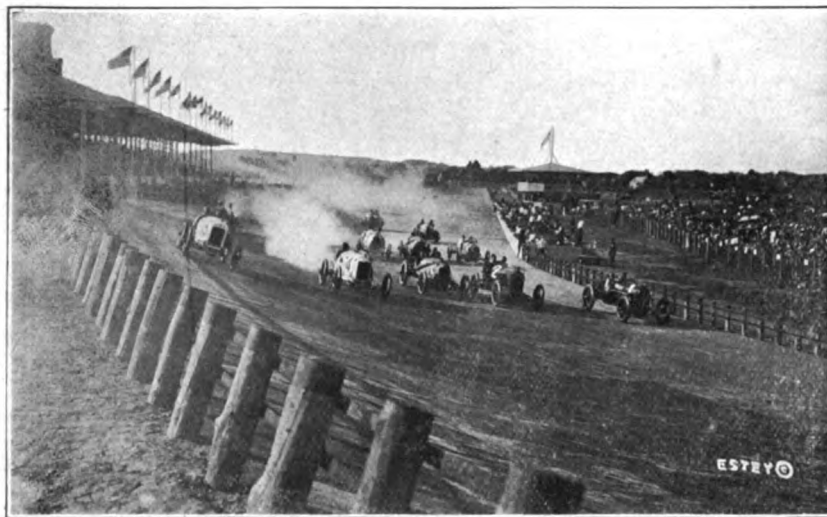
1. Gowdy, Excelsior	71¾ miles	\$500
2. Carroll, Indian	71½ miles	250
3. Walker, Harley-Davidson ..	69 miles	100
4. Leahy, Indian	65 miles	75
5. Spencer, Indian	61 miles	50
6. Welshaar, Harley-Davidson	59 miles	25
7. Helander, Indian	54 miles	..

dustury began holding fairs the races took place at that time.

Fredrick E. Perkins, the present owner of the track, has had it since 1892, and the last of the state fairs were held under his direction. One



Trial for the World's Record—Burman Taking One of the 31-Degree Turns in the Test in Which He Made a Mile in 45.73 Seconds—Note the Outside Barrier.



Warming Up for the 100-Mile Event—Rickenbacher Hugs the Rail—Next to Him Is Burman, While at the Extreme End of the Front Row Is De Palma.

There has been some dirt track motor racing at the park until about five years ago, when that form of sport began to lose interest. The crowd that gathered there for the first speedway race, however, demonstrated a marked revival in interest in the sport.

Rickenbacher's success brought him \$4000, Burman won \$2000, Haupt \$1000, De Palma \$700, Henderson \$600, Myers \$400 and Vail \$300. Cleary, in the Bugatti that Oldfield tried out early in the season, was eighth.

The time was 20 miles an hour slower than that made on the one-mile board speedway at Des Moines, Ia., Aug. 7, when a 300-mile race was run at 87 miles an hour. It was slightly faster than the 100-mile record for dirt tracks which was made by Tom Alley at Hamline, Minn., in 1914, his time being 1:31:30.

At the start Rickenbacher had the pole with De Palma and Burman close behind him. He held it only for a lap or two, when engine trouble began to appear in his black Maxwell special, and at the end of the 15th mile he had to stop at the pits for adjustments. He lost three laps.

De Palma took the lead in the second mile and held it till the sixth, when Burman, who had been pushing him, came up from behind, passed him, and

held the lead for two miles. De Palma again took the lead in the eighth mile.

In the 16th lap, Le Cain, who was driving a Pugh Brothers' Special, entered by a well known firm of automobile dealers in Providence, pulled to the pit with a broken crankshaft and retired. His car had been smoking voluminously.

Rickenbacher drove desperately, taking the curves at a speed that verged on recklessness, and his consistent work gave him the lead at the 77th mile. Up to that time the first position was held alternately by De Palma and Burman, with Henderson close up.

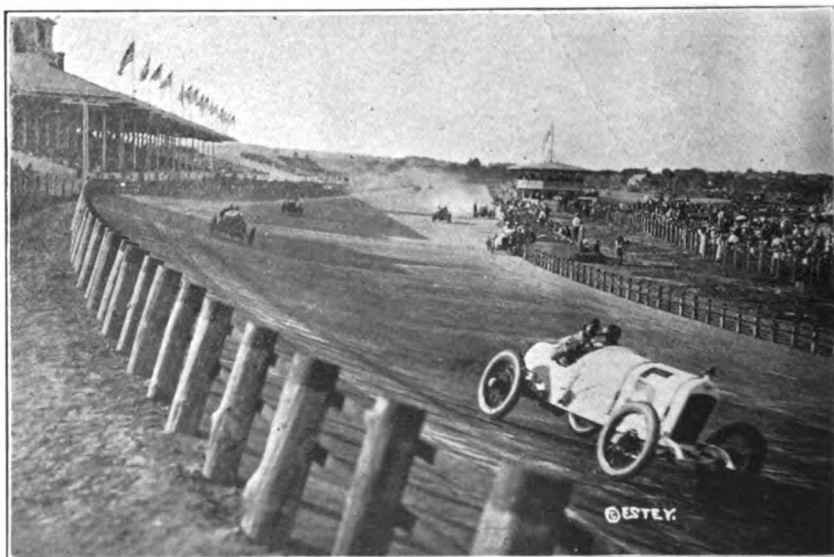
Rickenbacher's struggle to regain his position at the head of the procession thrilled the crowd, which cheered loudly every time he came

25-MILE NON-STOCK FREE-FOR-ALL AUTO RACE.

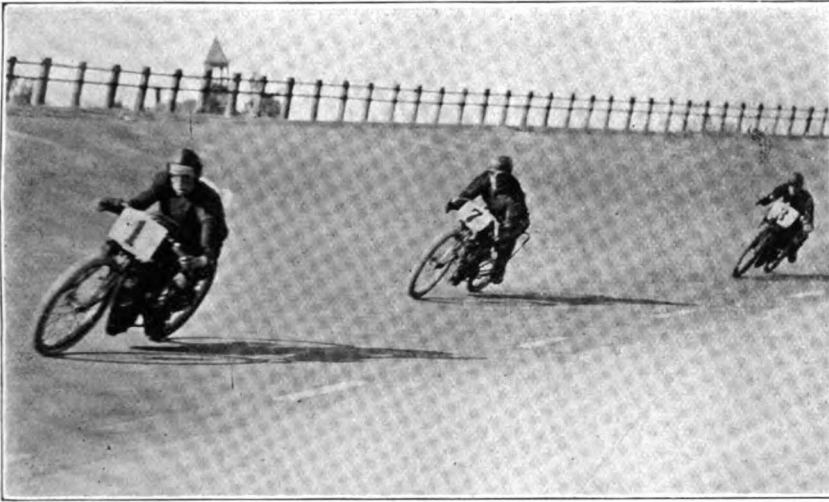
1. Burman, Peugeot	21:29.96	\$400
2. De Palma, Stutz	21:31.50	300
3. Haupt, Duesenberg	22:01.45	200
4. Jones, Peugeot	22:10.85	100

down the stretch. His best miles were being done in about 50 seconds.

In the 43rd mile the engine of Grant's six-



De Palma in a Stutz Leading the Procession and Speeding Along at the Average Rate of 66 Miles an Hour—Close Behind Is Burman, While Rickenbacher Is Seen Near the Judges' Stand.



The Winners of the Motorcycle Race Speeding at Over 70 Miles an Hour—No. 1 Is Carroll, Who Finished Second; No. 7 Is Gowdy, Who Won the Race.

cylinder Sunbeam, owned by Paul Smith of Pawtucket, R. I., which had been missing for some time, necessitated attention. It took 10 minutes to get it in running form.

Cleary, in the Bugatti, owned by C. F. Fuller of Pawtucket, left the track at the same time Grant did, but his troubles did not delay him long.

De Palma was first at 50 miles, in 45 minutes 15 1/5 seconds. Henderson had been falling back rapidly, and Willie Haupt held third place at this stage of the run. At 53 miles Rickenbacher had regained two of his lost laps and was still going strong. Burman got into the lead on the

59th mile. Haupt had now been lapped by both the leaders, who were alone. Burman was still holding the lead at the 65th mile.

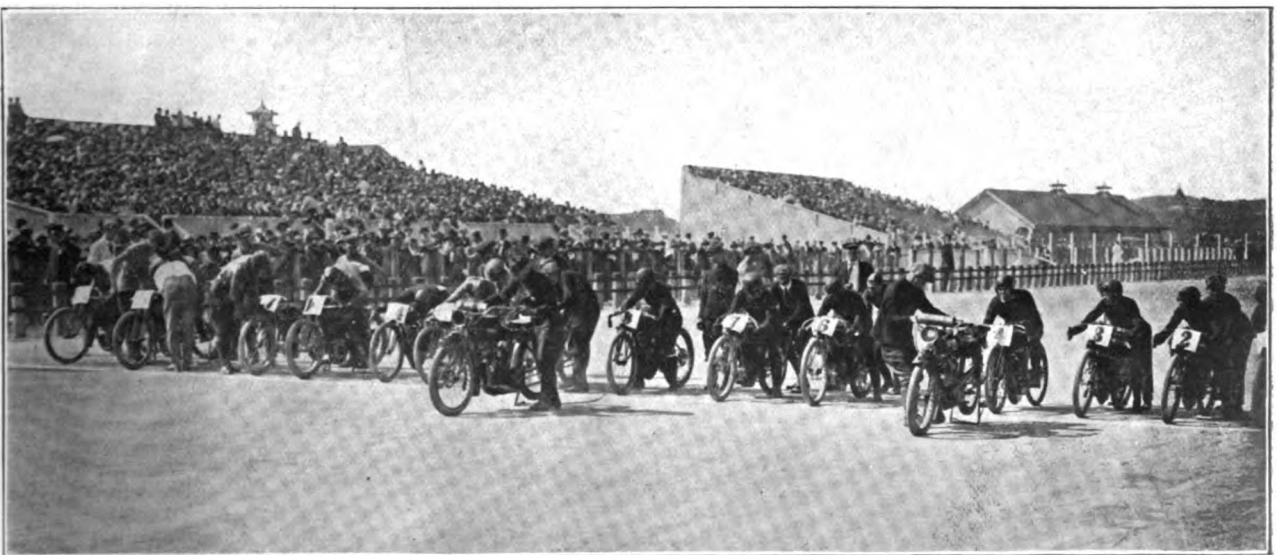
On the 73rd lap Rickenbacher came up from behind and passed De Palma, who had stopped at the pits, taking second place in the procession. In the 75th mile Dickenson's Stutz collided with the fence and an axle was broken. He and his mechanic were uninjured.

Rickenbacher Holds the Lead.

Once in the lead Rickenbacher maintained a speed sufficient to hold it safely and it became apparent that barring accidents he would win the race. He

lapped De Palma on the 85th mile and had half a lap on Burman. At 90 miles he had increased his lead over De Palma by a lap and a half and Burman was three-quarters of a mile behind. The cars were substantially in this position throughout the last 10 miles to the finish.

The 100-mile race was preceded by a 25-mile free-for-all and a one-hour motorcycle race. De Palma led in the 25-mile event for most of the distance, but Burman finally got the lead and won in 21 minutes 29.96 seconds. He beat De Palma by two seconds. Willie Haupt, in a Duesenberg, was third, and Walter Jones, in a Peugeot, fourth. There were only four prizes



Line-Up for the Start of the One-Hour Motorcycle Race, Which Was Limited to 20 Starters and Machines of 61 Cubic Inches—The Winner, Gowdy, Completed 71 1/4 Miles in the Hour.

in this race. Burman won \$400, De Palma \$300, Haupt \$200 and Walter Jones \$100.

Seven cars started, but Henderson, in a Duesenberg, Vail, in his Mulford Special, and Dickinson, in a Stutz, did not place. For the first 17 laps it was a fight between De Palma, Burman and Henderson. For eight laps De Palma made the pace and then Burman took it. In the 11th De Palma got the lead again and held it until the 22nd mile, when Burman came by him in a fast sprint for the finish. De Palma said later that he had slowed down on account of a signal from the officials following a slight accident on the back stretch, but Burman did not modify his pace and came home an easy winner. The officials became confused on the number of laps made by the cars and did not drop the flag until the 26th mile had been finished.

The scores became mixed in the one-hour motorcycle race. It was first announced that Teddy Carrol of Springfield had won, but two hours later this decision was changed and first place given to Carl Gowdy of Chicago. Gowdy made $71\frac{3}{4}$ miles in the hour and Carroll actually was a quarter of a mile behind. The mistake grew out of the fact that one of Gowdy's laps was overlooked.

Otto Walker was third, with 69 miles, William Leahy fourth, with 65 miles, B. M. Spencer fifth, with 61 miles, and Charles Helander seventh, with 54 miles. Prizes were \$500, \$250, \$100, \$75, \$50 and \$25.

From the start it was evident that either Carroll or Gowdy would win. Carroll held the lead for 17 miles, but Gowdy passed him in the 18th lap. Carroll then retook it and held it until the 24th mile, when he again lost it to Gowdy.

The Harley-Davidson machines did not arrive at the track until 10 minutes before the race started. They were lifted out of the crates, fitted with saddles and pedals and thrown over the fence to enter the competition.

Just before the beginning of the events, Bob Burman drove his Peugeot out onto the track for a trial against time for one mile. His first effort resulted in the time of 46.22 seconds. He tried the second time, taking two rounds of the course to warm up, and made the mile in 45.73 seconds.

TWENTY-EIGHT CARS IN ASTOR CUP.

Among the cars entered in the \$50,000 Astor Cup race are nine of foreign make. Harry S. Harkness, president of the Speedway company,

has entered to drive a Delage. He was a race driver in the days of Alexander Winton and Albert C. Bostwick. In 1905 he broke the Boston to New York record and won a hill climb to the summit of Mount Washington. Some of the prominent entries are as follows:

Name.	Make.	Name	Make.
De Palma	Mercedes	Pullen	Mercer
Oldfield	Delage	Ruckstell	Mercer
Harkness	Delage	Rickenbacher	Maxwell
Cooper	Stutz	Porporato	F. R. P.
Anderson	Stutz	Chevrolet	Car not named
Resta	Peugeot	O'Donnell	Duesenberg
Burman	Peugeot	Henderson	Duesenberg
Mulford	Peugeot	Vail	Mulford Special
Altken	Peugeot	Alley	Ogren
Wilcox	Peugeot	Halbe	Sebring
Moore	Sunbeam	Bergdoll	Erwin Special

Elimination trials were held at the speedway Sept. 24 and 25, at which each car had to show a speed of at least 85 miles an hour for one lap. As is usual, they will be positioned in the race according to the speed made in the elimination trials.

BOSCH PRIZES FOR SHEEPSHEAD BAY.

The Bosch Magneto Company has offered several prizes in addition to those put up by the Sheepshead Bay Speedway management for the Astor Cup race. The winning driver will receive from the Bosch company \$500 in gold, the second driver \$300 and the third driver \$200. In addition to these prizes there will be a prize of \$100 for each car to place provided the winner makes a better average than the best that has heretofore been made in an American long distance contest, 101.86 miles per hour. A similar amount is offered under the same conditions to the second and third men. All the prizes are offered on the further condition that the drivers must employ Bosch magnetos.

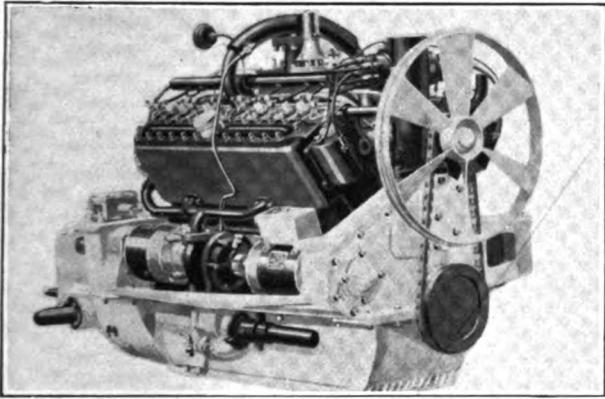
CHANGE IN SHOW REGULATIONS.

Plans are being perfected for the New York show which will be held in the Grand Central palace. S. A. Miles, the show manager, has adopted a new rule, which will require that applicants must deposit 25 per cent. of the value of the space called for. This makes the deposit payable two weeks earlier than previously and is expected to prevent firms from applying for desirable space which they do not later use. The show will be held from Dec. 31 to Jan. 8. It will consist exclusively of passenger cars for private use.

MOTOR STARTING AND CAR LIGHTING.

Bijur Single and Two-Unit Systems—Characteristics of Generators—Regulation of Charging Current—Automatic Control—Methods of Operating Motors.

IN THE considerations of the different electric systems for starting and lighting and supplying current for ignition for pleasure cars and motor trucks that will follow, the general princi-



Packard Twin Six Engine with Bijur Two-Unit Starting and Lighting Equipment.

ples already stated can be generally applied. Each system will differ somewhat from another. There are now something like 75 different makes that are used in such numbers as to justify commercial recognition, including those that supply current for lighting, or combination systems that include both lighting and starting, or lighting, starting and ignition, and this number is constantly increasing.

Of this total about 30 may be regarded as combination, and in some instances the manufacturers produce two or three different types, so that the number of practical systems that may be used by builders of American vehicles will at this writing probably considerably exceed 60, each of which is distinct.

The intention is to consider a number of these systems separately with a view of showing the number of units and their arrangement in typical installations, and later to give special attention to the care that is essential to the maintenance of these systems in normal operative condition, that is, so that good efficiency shall be obtained. In following this plan the make and the type will be stated to differentiate a specific system.

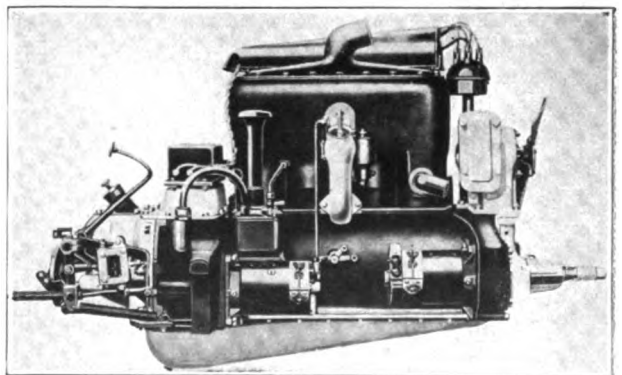
The Bijur single-unit starting and lighting equipment consists of a motor-generator that is

usually driven by a silent chain from the crankshaft at a ratio of approximately three to one—that is, the motor-generator is turned three times for every revolution of the engine. The motor-generator is a compound wound type, having shunt and series windings that have differential action when the machine is operated as a generator, and cumulative action when it is operated as a motor.

The machine will operate as a motor until it turns approximately 1000 revolutions a minute, when it will operate as a generator and will continue as long as its revolutions exceed 1000. With the average rear axle ratios the motor will become a generator at slow vehicle speeds. The voltage generated is variable, as the regulation is for current. At slow speeds the current is maintained substantially constant, but it is diminished as the speed is increased. This regulation is effected by the differential action of the shunt and series field, and the connection of the shunt field between one of the main brushes and an auxiliary or regulating brush.

Machine Always in Operation.

As the machine is driven by a chain it is always coupled to the engine, and it will turn when the engine is turned, so that when the engine is turning the machine, if its revolutions are less than 1000, is working as a motor and is driving the engine, or it is charging the battery, unless



Hupp Model N Motor with Bijur Two-Unit Lighting and Starting Equipment and Single Contact Switch.

provision has been made to disconnect the generator from the battery and to open its field circuit. Both of these conditions obtain, according

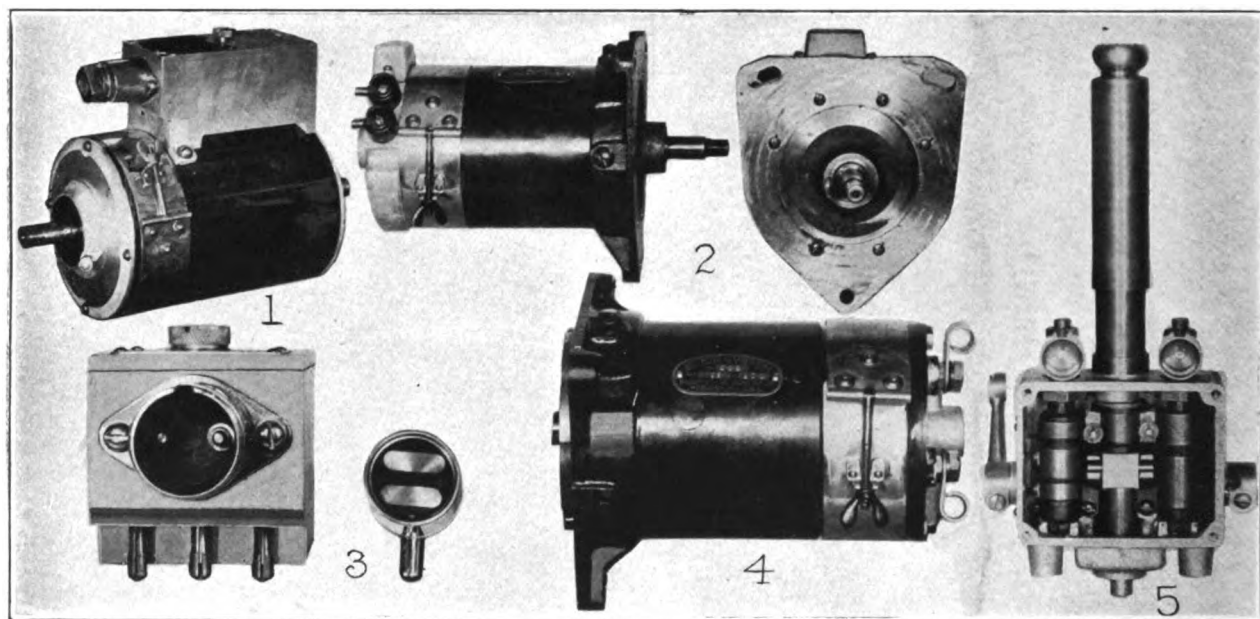
to the equipment of the vehicle in which it is installed.

With these installations there is no automatic switch, the machine either drawing current from the battery or charging current into it, but by a manually operated two-position switch the ignition circuit may be opened or closed and the motor-generator connection with the battery broken. With the latter a three-position switch is used in which in the "off" position the motor-generator is disconnected from the battery, the field circuit of the motor-generator is open and the ignition circuit is open. In the "on" position the two circuits are closed and the battery connected. In the "idle" position the ignition circuit is closed, but the motor-generator is disconnected

ate 12 volts, and with it is used a 12-volt, 35 ampere-hour battery.

Bijur Two-Unit Systems.

The Bijur two-unit system is produced in two types, the first of which is the series wound motor and a constant current generator. This system may be used with a magneto as a source for ignition, or a separate interrupter, and distributor may be installed. The constant current generator is shunt wound and regulation is obtained by the shunt field being connected between one of the main brushes and an auxiliary or regulating brush. These units are self-contained and no separate mounting and connecting of an automatic switch is necessary. The switch is mounted inside the aluminum housing on the commuta-



Bijur Starting and Lighting Equipment: 1, Constant Voltage Generator with Regulator in Place; 2, Constant Current Generator (Side and End Views), the Rectangular Aluminum Housing on the End of the Generator Case Covering the Field Fuse; 3, Regulator Box, End View, Showing the Connecting Pins, and an End View of the Reversing and Disconnecting Plugs; 4, Direct Acting Motor Fitted with Squared Shaft for Pinion; 5, Direct Acting Starting Switch.

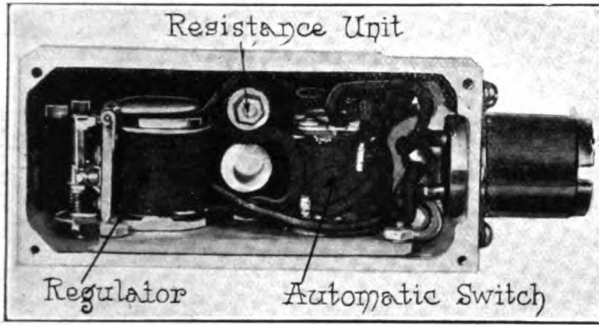
from the battery and its field circuit is open.

In the first instance the engine cannot be in operation without the motor either drawing upon or charging the battery, the switch opening the ignition circuit and preventing the engine being operated. In the second the ignition circuit is not interrupted and the engine can be operated at slow speeds without either charging or drawing upon the battery. Usually the carburetor is so adjusted that the engine cannot be throttled below the speed at which charging is begun, the purpose being to prevent battery discharge when the engine is idling and the car not moving. The motor-generators are usually designed to gener-

tor end of the machine, it being fully enclosed.

One characteristic of the construction is that the machines are reversible and the connections between it and the battery may be made without regard to polarity. Should wrong connection be made the generator will reverse itself automatically and assume the correct polarity to charge the battery. This is an insurance against damage that can be understood by any person unversed in electrical subjects. Each generator is fitted with a fuse in the field circuit to prevent damage in the event the circuit between the generator and battery is opened. Should the generator be operated with the circuit open there

would be an abnormal rise in voltage that would damage the field winding unless it were protected by the fuse.



Regulator Box with Cover Removed, Showing Resistance Unit, Regulator and Automatic Switch.

The generator is designed for six volts and to produce current for the lights and to charge the battery when the engine is driven at speeds equivalent to 10 miles or more an hour. When the engine is idle or the car is moving at less than the speed specified, all current for the lamps is drawn from the battery. The starting motor is idle, save during the period its power is required for starting the engine. The generator, after it begins to charge the battery, will generate a constant current. The automatic switch for opening and closing the circuit between the generator and the battery is adjusted at the factory and no further attention to this is necessary.

But two wires lead from the generator, these being connected with the battery through a meter and a junction block and fuse block. The generator should always be so connected that the current indicator will show "charge" when the engine is running equal to 10 miles vehicle speed. At one end of the generator in the aluminum housing that is held in place by two screws is the glass-enclosed fuse. In the event that the machine is driven without the storage battery being connected, the field fuse should be removed. The generator should never be driven disconnected from the battery without removing this fuse.

The Charging Indications.

A charge indicator, usually located conveniently in sight, shows the operation of this system, and will record appreciable current flow into or from the battery. When the battery is neither receiving nor giving current, the indicator stands at "floating;" when the charging current exceeds two amperes the indicator stands at "charge," and when the current drawn from the battery exceeds two amperes the indicator stands at "discharge." When a machine is driven in excess of 12 miles an hour, with no lights

burning, the indicator should be at "charge." With this speed and the lights burning the indicator should show "charge" or "floating." The indicator should never show "discharge" when the car is driven in excess of 12 miles an hour and no lights are burning.

The automatic switch in the generator will function and connect with the generator to the battery when the speed of the vehicle is such that the generator can supply current to the battery, and it disconnects the battery from the generator when the speed is too low for charging. While charging, just before the battery is disconnected from the generator, the indicator will stand at "discharge" for a moment, and will swing to and remain at "floating" if no lights are burning. With this system the battery generally used is six-volt, 80 ampere-hour capacity. This is sufficient to meet all requirements for lighting and starting the engine.

The Second Two-Unit System.

The second Bijur two-unit system differs with the first in that it is a constant voltage generator and a series motor. That is, the motor is the same, but the generator is built to produce current at a constant voltage. The Bijur constant voltage generators are shunt wound, and the regulation is obtained by varying the excitation in this winding.

The principal circuits in the regulating system of this generator are shown in an accompanying illustration, to which the attention of the reader is directed. By reference to this one will note that in series with the shunt winding indicated as 11 in the drawing is a fixed resistance shown as 12, and the regulation is obtained by short-circuiting this resistance when the generator voltage falls below normal, and removing the short circuit when the generator voltage rises above normal.

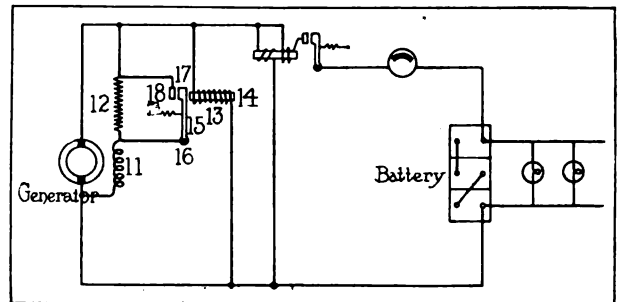


Diagram Showing the System of Regulating the Constant Voltage Generator.

The regulator for the system consists of an iron core that is indicated as 14, which has a single winding shown as 13, this winding being con-

nected across the generator brushes. The current in this winding and the resultant pull of the core depends, therefore, upon the voltage of the

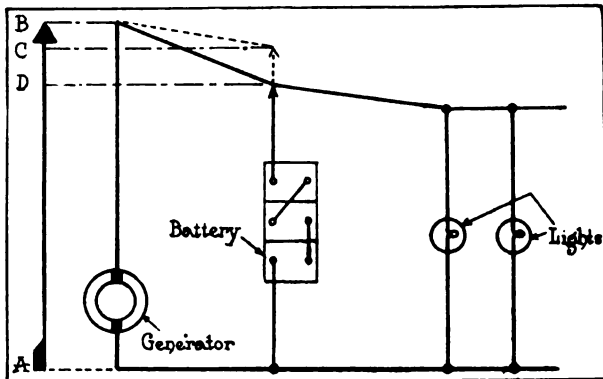


Chart Indicating the Conditions of Battery Charging with the Constant Voltage Regulator.

generator. The vibrating armature designated as 15 is retracted away from the core by a spring. When the spring pull predominates the armature moves away from the core; which closes the contacts designated as 17 and 18, and creates a low resistance circuit around the resistance 12. The field current increases and the generator voltage builds or increases; when the voltage exceeds the normal value established the attraction of the core predominates and the armature is attracted to the core, which again places the resistance in the field circuit.

Feature of the Regulator.

One of the main features of the regulator is that the contacts which shunt the resistance in series with the field winding in and out of circuit are continually changing or shifting and do not regularly make contact at the same point. Another drawing shows the manner in which the contacts are mounted. Each contact is mounted on a thin reed spring that is fixed at the end opposite to the contact. The reeds carrying the top and bottom contacts are mounted at a 90-degree angle, so that the point of the contact continually shifts, due to vibration and resulting oscillation of the contacts. Continuous vibration is obtained because one of the contact reeds is mounted on the regulator armature, which vibrates at a high rate.

Shifting of the Contacts.

The shifting of the contacts prevents the formation of minute projections on the negative contact and minute recesses in the positive contact, so that the contacts never stick or "freeze." Wear is manifested by the positive contact becoming thinner and the negative contact becoming thicker. Periodically the disconnecting plug

is turned in its socket, which reverses the polarity of the contacts so that the metal which has been deposited from one contact to the other is returned. Once in two weeks, or after each 500 miles driving, is advised for turning the plug.

The disconnecting plug is a brass fitting, to which two wires from the generator are soldered, that is inserted in a receptacle in the aluminum box mounted on top of the generator. This plug has two flat parallel faces. This plug should never be placed in its receptacle so that these flat faces stand in a vertical position, but it should be pushed in and turned in either direction past its central position until it locks. Unlocking is accomplished by pushing the plug inward, and locking by turning it past the vertical position.

Contact Vibrations Are Regular.

The vibrations of the contacts do not take place irregularly, but range from 100 to 150 a second. The resulting voltage is the resultant of a series of fine ripples above and below the mean value for which the regulator is adjusted. The amplitude of these waves is very small and as the frequency is high, satisfactory lighting can be obtained from the generator with no battery connected in the circuit.

While direct statement has not been made, the assumption has been that the reader understands that the Bijur systems, in common with all others that include electric starting, use a battery as a source from which current is drawn. The generators are connected with these batteries, and from the batteries all current that is

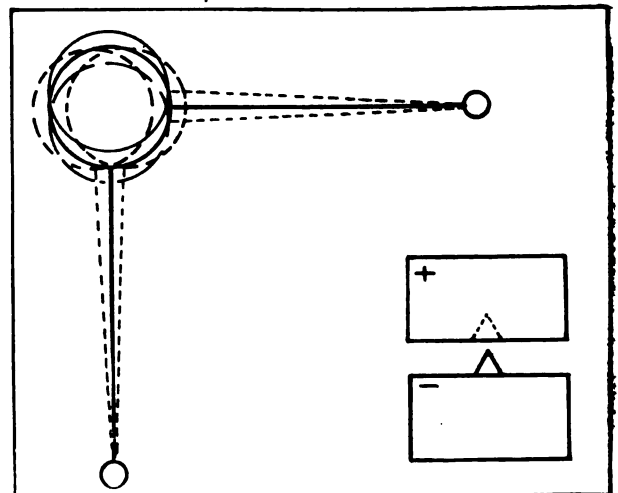
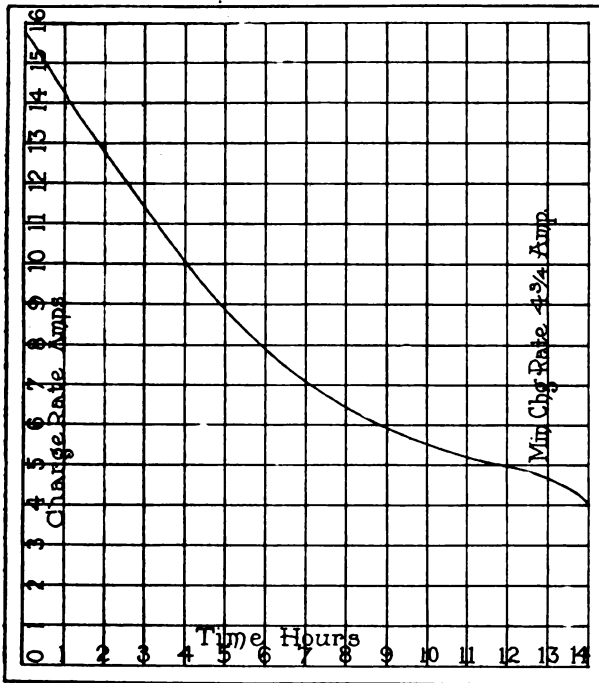


Diagram Showing the Vibrations of the Contacts of the Constant Voltage Regulator.

used for the starting motors, the lighting and other electrical devices, is supplied.

The constant voltage of the generator of this

system is shown by an accompanying illustration. In this the constant voltage of the generator is illustrated by the height of the line AB,



Curve Illustrating the Tapering-Off Charge Given a Battery with a Constant Voltage Regulator.

while the voltage of a partially discharged battery is shown by the height indicated by AD. The difference between the battery and the generator voltage is therefore available for sending current into the battery. As the charging is continued the battery voltage increases, and in the drawing AC represents the voltage of a fully charged battery. The difference between the generator and battery voltage is now reduced to BC, so that the charging current is reduced accordingly. The result obtained is that the discharged battery is charged at a rapid rate, and the charging rate is tapered off as the battery becomes charged. The tapering off of the charging rate as the charge is continued is shown in the accompanying chart, which is a curve plotted from the result of a test made by the Packard Motor Car Company. This chart indicates the charging rate in amperes, the time in hours, and shows the gradual diminution of the charging rate from nearly 16 to a minimum of 4.75 amperes during a period of 14 hours.

With the constant voltage system equipment the automatic switch, voltage regulator and the field resistance unit are mounted in an aluminum box that is placed on the top of the generator case. This box is held in place by a single knurled nut and by three connecting pins that fit into three receptacles in the generator case. The two wires leading from the generator are soldered into a connecting plug. The regulation mechanism can be readily changed by anyone, as no electrical or mechanical knowledge or skill is required. Accompanying illustrations show the generator with the regulator box mounted on it, an interior view of the regulator box, specifying the several elements it contains, and another shows an end view of the regulator, in which the connecting pins are plainly seen, as well as an end view of the disconnecting and reversing plugs.

In these systems the ammeters are connected between the generators and the batteries, and for that reason only indicate the generator output. When the engine is running the meter should indicate, and should there be no indication by the meter, this is sufficient notification that there is trouble that should receive immediate attention.

Two Classes of Starting Motors.

The two-unit systems are divided into two classifications (aside from there being two types of generators) by the starting motors, one type being geared and the other direct acting. With the geared motors double reduction gears are included between the starting motor and the engine flywheel, and the system also includes an over-running clutch.

With the direct acting motors, however, the

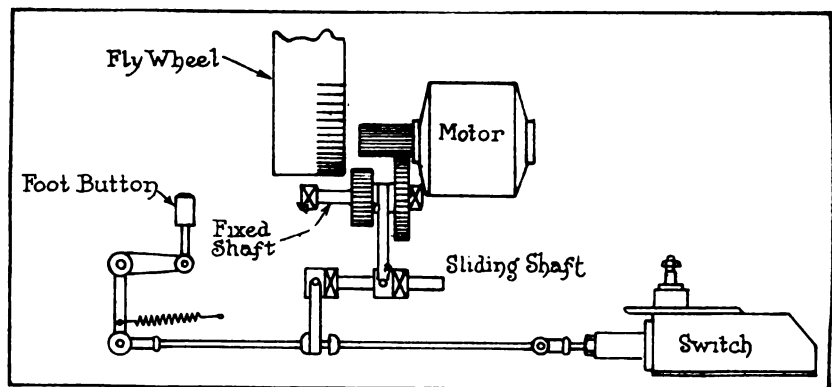


Diagram Showing the Parts Utilized for a Complete Starting System Having Double Reduction Gearing Between Motor and Engine Flywheel.

pinion mounted on the armature shaft is meshed into teeth cut in the periphery of the flywheel, and the drive is direct from the motor to the fly-

wheel. The motor armature shaft is squared and on it is mounted a pinion having a broached hole that can be moved horizontally on the shaft into and out of mesh with the flywheel teeth. Direct acting motors are also adapted for use with a screw shaft that carries a weighted pinion which can be moved into and out of mesh.

Motors Only Used for Starting.

The motors of the two-unit systems are never used save for starting the engines and when starting are never operated for a longer period than is necessary to have the engine fire regularly, for further operation is a needless drain upon the battery, and there is necessity of having the battery sufficiently charged to meet any demand that may be made upon it. The motors are started either by pulling a handle that will actuate the linkage that operates the coupling mechanism, or pressing a switch plunger. An accompanying illustration shows diagrammatically the operation of a system in which there is a double reduction gearing between the motor and the flywheel of the engine. In this the gear that is meshed with the motor pinion is the outer member of a roller clutch.

The Bijur Starting Switches.

The starting switches of Bijur manufacture are of several types. Those generally used are provided with preliminary contacts which connect the battery and the starting motor through a resistance located inside the switch. This preliminary contact is made just prior to the meshing of the starting gears and flywheel, which causes the motor to rotate at slow speed and with little power, so that full meshing of the gears is insured.

The switches are direct acting and indirect. One of the illustrations is of a direct acting type in which a heel button projects through the floor board and depressing this heel button makes the two switch contacts and also shifts the gears into mesh with the teeth of the flywheel. In the indirect types the starting switch is connected through a system of linkage to a starting pedal located at the driver's seat. There are switches made in which there is no preliminary contact, the pinion of the starting motor being drawn into mesh with the teeth of the flywheel before the contact of the starting switch is made. Release of the starting pedal and the tension of a strong helical spring causes the withdrawal of the motor pinion.

While the systems described may be regarded as standard, this company produces machines of various sizes and outputs, both in constant voltage and constant current generators, and gener-

ators are also built that are adapted for battery ignition. When built for 12, 16 and 18 volts, the generators are regarded as special.

These systems are intended for lighting and the control of the current from the battery and the regulation of the lights differs according to the requirements of the builders of the vehicles.

(To Be Continued.)

OVERLAND IS STARTED BY WIRELESS.

A feature of the Overland exhibit at the state fair in Indianapolis that attracted great attention was an arrangement for starting an Overland car by wireless from a sales room located five miles away.

A complete wireless apparatus, with an aerial terminal on the top of the building, was put in at the sales rooms. This stepped up an alternating current of 300 volts to 16,000 volts and was capable of projecting messages for 300 miles. The car at the fair grounds was fitted with a receiving apparatus and the necessary automatic switches and relays for starting. An automatic switch permitted the motor to run for 45 seconds after starting and then stopped it by cutting off the magneto.

The operation of starting the car was repeated at five-minute intervals throughout the fair. A time switch in the city controlled the operation, so that it was never necessary to touch the mechanism with the human hand. Governor Ralston of Indiana started the motor the first time by touching a key at the station in Indianapolis.

SURE CURE FOR ROAD HOGS.

Dr. A. L. Marks of Spokane has a new method of overcoming the road hog who refuses to turn out for the car behind. He keeps a pocket full of large torpedoes, similar to those used by children on the Fourth of July. He explodes one of these against the back wheel of the car driven by the obstinate motorist and then innocently drives by while the man alights to examine his tires for the blow out he is sure he has heard.

Palmer E. Winslow, who has been connected with the Hupp Motor Car Company advertising department for the last 18 months, has been appointed secretary to J. Walter Drake, president of the company. He was formerly treasurer of the Peninsular Press, Detroit.

GENERAL NEWS OF THE INDUSTRY.

General Motors Declares Special Cash Dividend on Common of \$50 Per Share— Canadian Ford Earns \$3,000,000—L. P. C. Company in Bankruptcy.

CONFORMING to expectations, but sensational, nevertheless, is the announcement that the General Motors Company has declared a special cash dividend of \$50 per share on the common stock, and that regular dividends on that stock will be inaugurated, the rate to be fixed by the incoming board of directors, which is to be elected Nov. 16. This is the first dividend ever paid on the common stock.

At the same time the regular 3½ per cent. dividend on the preferred stock was declared. The preferred dividend is payable Nov. 1 to stockholders of record Sept. 30, and the common on Oct. 15 to stockholders of record Sept. 30.

Statement for the fiscal year ended July 31 compares as follows:

	1915.	1914.	1913.
Net profits	\$14,926,322	\$7,949,412	\$8,284,139
General Motor shares..	14,794,190	7,819,968	8,184,052
Accident interest notes	336,387	570,235	724,581
Balance for dividends..	14,457,803	7,249,734	7,459,471
Preferred dividends	1,048,064	1,048,964	1,048,534
Surplus	*13,408,839	6,201,055	6,410,937

*Equal to 81.2% on \$16,501,783 common stock against 37.57% previous year.

Profit and loss account follows:

Profit and loss surplus July 31, 1914.....	\$6,689,428
Surplus for year ended July 31, 1915.....	13,408,839

Total	\$20,098,267
Plants and equipment.....	113,107
Profit and loss July 31, 1915.....	19,985,160

One week after the declaration of dividend the General Motors stock was the sensation on the New York exchange. In one day it advanced 54 points, but closed showing a net advance of 27 points for the day. The stock then was quoted at 323. Its high mark had been 350.

The price range of General Motors common and preferred for the past five years is shown as follows:

	Common		Preferred	
	High	Low	High	Low
1915.....	323	82	115½	90%
1914.....	99	37½	95	70
1913.....	40	25	81½	70
1912.....	42½	30	82½	70½
1911.....	51½	35	86	74½

The General Motors Company is a New Jersey corporation and was formed Sept. 16, 1908. It now owns all the stock or has a controlling or substantial stock interest in the following active

companies: Buick, Cadillac, Cartecar, Champion Ignition, General Motors, Ltd., of London, General Motors Export Company, General Motors Truck Company, Jackson-Church-Wilcox, McLaughlin, Northway, Oakland, Olds and Weston-Mott.

In view of the expiration of the voting trust on Oct. 1, 1915, the following proxy committee, representing all interests, has been agreed upon for the annual meeting on Nov. 16: P. S. Du Pont, W. C. Durant, L. G. Kaufman, C. W. Nash and J. J. Storrow. They will vote for the following directors: Lamont Belin, A. G. Bishop, E. W. Clark, P. S. du Pont, W. C. Durant, J. A. Haskell, L. G. Kaufman, J. H. McClermont, C. S. Mott, C. W. Nash, Thomas Neal, S. F. Pryor, J. J. Roskob, C. H. Sabin, Albert Strauss, J. J. Storrow and A. H. Wiggin.

BIG FUTURE FOR CANADIAN FORD.

Net earnings for the present year for the Ford Motor Company of Canada are estimated at \$3,000,000, or 300 per cent. of the stock, and it is the general opinion that the stock dividend should be about 700 per cent. The regular dividend is 40 per cent. cash per annum.

The present capital of the company, \$1,000,000, represents a growth from \$125,000 in 1906, through declarations of stock dividends. In 1912 the company sold 6300 cars, in 1913 it sold 11,000 and in 1914, 16,500. For this year, notwithstanding adverse conditions due to war, the sale will reach nearly 25,000 cars.

The stock is now quoted around \$1500 a share, having advanced about \$1000 over a little more than a month ago.

STUDEBAKER SHORTENS HOURS.

Starting on Nov. 1, the Studebaker Corporation will inaugurate a working schedule of eight hours for its Detroit employees. This step is consistent with Studebaker policies to better the working conditions of its men, among which is the system of medical examination, which is considered a protective measure in that it gives as-

surance that the employee is fit for his employment. No matter how skilled a man may be, his employment is contingent upon successfully passing this examination. It is so rigid that insuring companies accept it to issue general policies covering the lives of the Studebaker men.

The company maintains a modern hospital, and recently expended about \$60,000 to modernize and sanitize lavatories. The Studebaker plant is understood to be the first automobile concern in Detroit to adopt the eight-hour schedule.

L. P. C. MOTOR COMPANY FAILS.

The L. P. C. Motor Company, Racine, Wis., which started with a capital of \$2,000,000 after the Mitchell Motor Company had been taken

over by the bond holders, went into voluntary bankruptcy on Sept. 16. This marks the second important financial difficulty in which Capt. William Mitchell Lewis, who was founder of the Mitchell Company, has been involved recently.

Capt. Mitchell made the statement that the business would be continued under the assignee, and added that the assignment was made because of the inability to secure funds with which to meet obligations maturing in September.



C. W. Nash, President of General Motors Company.

MACMANUS IN NEW POSITION.

Theodore F. MacManus, one of the best known advertising men in the country, has joined the Erwin & Wassey Company, Chicago, as vice president, and will have charge of the Detroit office of the company. His principal associates will be Charles R. Erwin, president, and Louis R. Wassey and W. T. Jefferson.

With the affiliation of Mr. MacManus the Erwin & Wassey company becomes one of the

strongest agencies in the country and will place more than \$2,000,000 in business annually through the Detroit office alone. One of the large accounts will be that of the Goodyear Tire and Rubber Company, whose advertising will be placed through the Detroit and Chicago offices.

The former associates of Mr. MacManus remain with him in the new organization, and there will be several additions to the staff, probably the most notable being Gerald Page-Wood, who won considerable distinction in handling campaigns for Timken Axle and Mazda lamps.

BULL TO ASSIST CRAWFORD.

Arthur A. Bull, one of the best known junior engineers of Great Britain, has been appointed by President J. J. Cole as assistant to Charles S. Crawford, chief engineer of the Cole Motor Car Company.

Mr. Bull comes from the Northway Motor Company, Detroit, and has been with several of the largest motor car manufacturing companies in this country and Europe, some of the companies being the Oldsmobile company of Lansing, the Humber, Ltd., of Great Britain, and the English branch of the Daimler company, builder of Mercedes cars.

Mr. Bull is a graduate of the Institute of Automobile Engineers of Great Britain, and his writings on technical subjects relating to motor construction have attracted wide attention. He will stay in Detroit for a while, and then join the Cole forces at Indianapolis.

CHALFANT DIRECTS EASTERN SALES.

E. P. Chalfant, known from coast to coast in the motor car and bicycle business, has been appointed manager of the eastern division, with headquarters in New York City for the Anderson Electric Vehicle Company. Accompanying this announcement is the statement that prices for Anderson electrics have been reduced from \$600 to \$725 per model.

Mr. Chalfant began with the bicycle business in 1892, retailing and jobbing in Atlanta, Ga. His next step was to the division management of the American Cycle Manufacturing Company, Chicago, in 1899, and then to general manager of the Association of Licensed Automobile Manufacturers. Next he went to the Packard Motor Car Company, leaving to become president of the E. R. Thomas Motor Car Company, Buffalo. In 1914 he became secretary of the Electric Automobile Manufacturers Association of Chicago.

HARRIS JOINS MUTUAL MOTORS.

Frederick A. Harris of Detroit, who resigned as commercial manager of the Hupp Motor Car Company, has acquired a substantial financial interest in the Mutual Motors Company, Jackson, Mich., and was elected vice president at a meeting of the directors.

Mr. Harris was one of the incorporators of the Brush Runabout Company, and its secretary and general treasurer. When the company was taken over by U. S. Motors he was given charge of the Brush department of that organization, with headquarters in New York City. It was then that he became well acquainted with Mr. Handley, president of the Mutual Motors, which later resulted in the appointment mentioned above.

GILBERT BROTHERS IN GIBNEY CO.

One of the first moves of Joseph M. Gilbert, recently elected vice president and director of sales of the Gibney Tire and Rubber Company, was to secure the services of his brother, Charles A. Gilbert, as general sales manager, with full charge of selling throughout the United States.

"Joe" Gilbert, who took a substantial stock interest in the Gibney company, gained considerable recognition for extraordinary ability with the United States Tire Company. His brother also distinguished himself with the United States Rubber Company, as Pacific Coast general sales manager, not only dealing with American trade, but with Oriental and Australian.

ALLEN COMPANY ELECTS OFFICERS.

At a meeting of stockholders of the Allen Motor Company, Fostoria, O., the following stockholders were elected to office: E. W. Allen, president; G. H. Baker, first vice president; J. E. Wright, second vice president and sales manager; W. O. Allen, treasurer and general manager; A. F. Wyant, secretary; L. A. Sommers, general superintendent.

A substantial dividend was declared and plans for an 8000 production were announced for 1916.

TWO CHALMERS TRAIN LOADS.

Two train loads of Chalmers cars were recently shipped from the factory to the New York distributors to fill orders of customers that had

already been secured. Over a quarter of a million dollars worth of cars paraded from the railroad yards to the Chalmers sales rooms. Sub-dealers in the New York territory were present to get as many of the cars as possible. They were entertained by the Chalmers Motor Car Company of New York and addresses were made by Sales Manager Paul Smith and by other Chalmers sales officials.

WOLLERING STUDEBAKER DIRECTOR.

A. F. Wollering, factory production manager for the Studebaker Corporation, has been elected to the directorate of the company. The promotion marks the culmination of a career that began as a factory boy in Milwaukee shops. His rapid progress began with his association with the Studebaker organization when the concern first entered into automobile manufacture.

As production manager. Mr. Wollering has several thousand men under his direction, and is responsible for the production



M. F. Wollering, New Studebaker Director.

of about 60,000 cars that the company will manufacture in the coming fiscal year. This large production is largely possible through his executive ability, and his democratic association with the men under him, to whom he is generally known as "Max." Mr. Wollering is but 37 years of age.

PAIGE-DETROIT ADDS TO PLANT.

In 60 days a large addition to the Paige-Detroit plant will be completed and in operation. This will make a large increase in production possible, although with the old facilities the plant has been increasing in production at a prodigious rate. It is officially stated that the business for August, 1915, is 300 per cent. greater than for the

same month last year. At present indications point to a 500 per cent. increase for September. The new building will be used partly for warehousing materials and parts. The plant is being fitted with a complete system of overhead conveyors to speed up the assembling operations to the highest point.

CARTER IS WINNING FAME.

F. C. Carter, eastern district manager for Herff-Brooks Corporation, is making a name for himself in the selling of automobiles and in organization work. Mr. Carter was in 1902-3 sales manager for the Conrad Motor Carriage Company, Buffalo, N. Y. The following year he became manager of the D. H. Lewis Motor Com-

pany, also of Buffalo, and in 1905 and 1906 was sales manager of the E. H. V. Company, Middletown, Conn. For the next five years he was manager of the Poppenberg Motor Car Company. In 1913 he began his work as factory representative with the Marathon Motor Works. He joined the Herff-Brooks



F. C. Carter, Eastern District Manager for Herff-Brooks.

as eastern district manager in 1914.

Every change Mr. Carter has made has been in the effect of a promotion, and with the Herff-Brooks Corporation he is showing the result of his years of eastern experience by greatly enlarging the company's eastern organization.

SHOW DRAWING DATE IS SET.

Drawings for space at the New York City and Chicago shows will take place at the office of the National Automobile Chamber of Commerce, 7 East 42nd street, New York City, on Oct. 7. Members of the N. A. C. C. will draw in the morning and non-members in the afternoon.

SPLITDORF BUYS DIXIE PATENTS.

The basic patents of the Dixie magneto, controlled by the Sumter Electrical Company, Sumter, S. C., through the invention of President C. T. Mason, were sold last week to the Splitdorf Electrical Company, Newark, N. J., for the sum of \$1,000,000. Rarely has such an amount changed hands for patents, but the Splitdorf company feels that the sum was well spent.

The demand for Dixie magnetoes is tremendous, the Splitdorf company making about 1500 daily, for single, fours, sixes, eights and 12's. Sumter magnetoes will continue to be made by Splitdorf as heretofore for the stationary engine, marine and tractor field formerly controlled by the Sumter company. Automobile, motorcycle and aeroplane Dixie models will be made exclusively at the huge Splitdorf plant at Newark, N. J.

BRUSH GOES TO SCRIPPS-BOOTH.

The Scripps-Booth Company, Detroit, announces that it has secured the services of A. P. Brush as consulting engineer. Mr. Brush has established a national reputation as one of the leading automobile engineers of the country, and his association with the Scripps-Booth car holds promise for some surprises in the future.

SMITH LEAVES GILMER CO.

The L. H. Gilmer Company announces that Manning J. Smith, formerly treasurer, is no longer connected with the firm. At the last meeting of the directors, J. S. Krauss, secretary, was elected to the office of treasurer, and is now officially occupying both offices.

DUNK FOR PREPAREDNESS.

Alfred O. Dunk, president of the Puritan Machine Company, announces that any of the employees who join the annual encampment of the Michigan National Guard, or the Naval Reserves, will be placed on full pay during absence from business.

F. R. Guyon has been appointed assistant manager of sales for the Elyria Iron and Steel Company, Cleveland. This company recently completed a new factory for the production of steel tubing.

SHORT LIVED LEATHER UPHOLSTERY.

It Comes from the Inside of the Hide and Is Less Serviceable than Modern Leather Substitutes that Are Used Extensively.

IN THE good old days fine workmanship and fine leather combined to produce many fine books, chairs and carriage cushions which were nearly indestructible and came in time to be highly prized heirlooms. In these times of widespread luxury innumerable replicas of those master-



Artificial Leather Is Used for Automobile Tops.

pieces are made and sold, but they have often been found to lack sadly in wearing quality.

Many purchasers looking over their automobiles, buggies or furniture after they have been used a few months have come to think that the modern upholsterer and leather worker has not the pride in his work of his predecessor and is satisfied to use dishonest materials, provided that they have an appearance of quality that will deceive the purchaser.

But the fact is that the man responsible for the leather that cracks or rips after a few months is not intentionally a "green goods" man. He is faced by conditions that he has not been able to control and of late has been worrying rather more than his customers who have bought his short lived product.

In the age when the heirloom was produced farming and stock raising were the leading industries throughout the world. Populations were smaller then and the people were poorer. The amount of leather used was far smaller and the number of cattle in proportion to the population far greater than it is at present.

Leather was cheap. The man who made grandfather's easy chair selected the finest hide from a large assortment, sliced off the delicately grained exterior and threw the rest away. Today the part he wasted would cost much more than the whole hide did then.

But the chair he turned out was a marvel of serviceability. So good was it that it made leather the most prized of all upholstery materials. Everybody wanted leather covered chairs and

sofas, and in their carriages and later in their automobiles, wished to ride on leather covered seats. There never has been found, perhaps never will be found, a better upholstering material than the fine grained leather from the outside of a good hide.

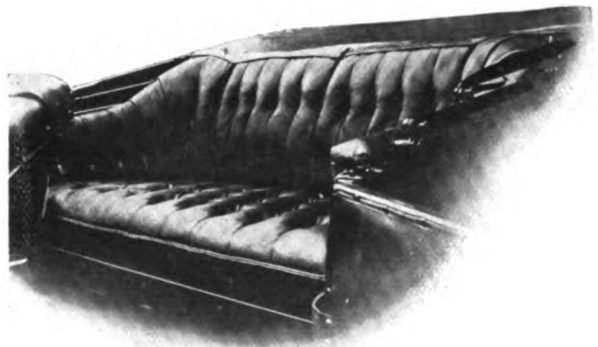
Good Leather Insufficient.

The demand for leather increased, and the amount of hides rapidly decreased. The tanners couldn't supply the demand—if they used only that part of the leather which had gone into the old easy chair. So they took the part that had been thrown away, saturated one side of it with a certain preparation and embossed upon it with steel plates under pressure an imitation of the grain in the best portion of the leather.

This new product was leather and yet it wasn't. It came out of a hide all right, so the tanner's conscience didn't hurt him when he sold it as leather. If it had been cut close to the firm exterior surface of the hide it might be reasonably strong and capable of good wear. If it came from the extreme inside of the hide, it was pulpy, loose in texture and with scarcely more strength than paper.

In reality it was imitation leather, made from the waste portions of real leather.

It was dressed up and sold by the tanners in great quantities. A confused trade terminology grew up which aimed to describe this split leather with the imitation grain as better than it was. That is to say the names used were calculated to



For Upholstery Artificial Leather Proves Eminently Satisfactory.

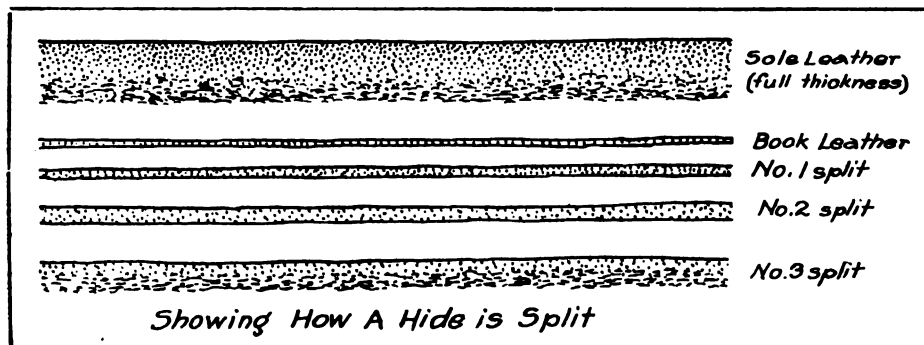
make it appear that the splits came from nearer the outside surface of the hide than they really did.

Many buyers of leather for upholstery purposes were unable to tell from the appearance of the goods just where they did come from. It is exceedingly difficult and only the most expert of experts can tell. As for the ordinary retail buyer he could judge nothing until the leather had been proved by use.

Poor Leather Injured Users.

But the furniture makers, automobile manufacturers and other buyers in large quantities felt the unfavorable influence on their product of leather upholstery that cracked and tore after slight use.

They have been active lately in demanding that the leather manufacturers adopt a standard terminology that will tell every buyer just exactly what part of the hide every slice of leather comes from.



Men outside the trade had been watching this situation in the leather business and because they were disinterested and logical they came to some novel and interesting conclusions concerning it.

One was that split leather treated with a surfacing compound and embossed with an imitation grain, is not really leather at all, but artificial leather. While it is possible in this way to produce a perfectly good looking leather, it is impossible to give the flabby interior portions of the hide the desired strength.

The next step was this: Why, if you are going to use imitation or artificial leather, not make it of some material that will imitate leather in strength as well as appearance?

They experimented with different cloths for this purpose and finally a specially woven cotton fabric of great strength and wearing ability was found. By coating this fabric with the same surfacing material that had been used on splits and embossing it in the same way, it was found possible to produce a leather substitute which looked

like real leather and had very nearly as much strength as the best grain leather and about twice the strength of coated splits.

Tests of this new material have shown that it is far stronger and more durable than some split leather, although it is not as durable as first class grain leather. But its cost is less than the split leather and only a fraction of that for fine outside leather. So on a basis of service and appearance balanced against cost the claim is made that this is the best value of any upholstery material that can be had.

Du Pont Fabrikoid an Example.

One of the best known and most widely advertised materials of this sort is Du Pont Fabrikoid, produced by the Du Pont Fabrikoid Company of Wilmington, Del.

Automobile manufacturers, as well as furniture makers, have for some years been seriously concerned over the poor quality and high prices of the leather they have used for upholstery. So

when this fabric was perfected, one producer who has made several hundred thousand cars, adopted it at once as the best solution of the upholstery problem. The result looked well and gave good service, but there was one drawback.

When the prospective buyers of motor cars asked what the up-

holstery material was made of they were told that it was artificial leather. The salesman for the competing car took pains to point out that his car was upholstered with "real leather"—which was true in the sense that the material had come out of a hide, even though it was less durable and looked no more like leather than the artificial leather. And that sometimes turned the sale.

Fine grained leather for upholstery is so good it has become a sort of fetish where upholstery is concerned. The public naturally knows nothing of the technicalities of the leather business, and regards leather as leather, to its own detriment when it gets the split leather kind.

Notwithstanding this drawback, the sales of Fabrikoid have been increasing enormously and it is rapidly coming into its own everywhere. But to enable the public to take advantage of the product to the limit of its serviceability, the Du-pont company has undertaken a widespread advertising campaign of an educational nature.

"How many hides has a cow?" they have asked and then explained that as leather is used for many purposes it has four hides instead of one and that at least two are rather poor stuff.

Since the European war began the already short supply of leather has become still more inadequate. The great demands for harness, shoes, belts and other leather goods have made it virtually impossible to secure leather of the best grade to upholster the 600,000 automobiles that are produced every year in the United States. It has been necessary to turn to some form of fabric upholstery, or else use inferior split leather.

Leather Shortage Not Serious Now.

But users will suffer little from this shortage, as Fabrikoid is more durable than two-thirds of the leather upholstery in use. It is pliable, comfortable and has the same appearance as the best grade of upholstering material. It is dust proof and water proof and non-absorbent—qualities in which it excels even the best leather. Its cost is less than poor leather and much less than the best leather. It is of uniform strength throughout and has no weak places in it, as is often the case with poor leather.

It consists of a base of specially woven cotton cloth coated with a tough, flexible material, and embossed by steel plates or rolls to produce the appearance and feeling of any desired natural grain leather. It is made in different grades, colors and width for various purposes. It is manufactured in continuous rolls, averaging 60 yards in length and from 36 to 54 inches in width.

There is no waste in cutting it, while in cutting hides from 25 to 33 per cent. is wasted. It is feasible to cut it in multiples just as cloth is cut in a clothing factory, whereas in cutting leather each piece must be handled by an expert.

It is supplied not only to manufacturers of furniture and motor cars, but the proper grade and texture will be provided for any individual who may have a re-upholstering job in his hands.

If it replaces split leather entirely, upholsters who use real leather will have to go back to the practise of the last century and waste two-thirds of their hides. But there are some uses, such as for sole leather, in which the entire hide is used and is necessary. And at the present

rate of increase in population and decrease in cattle the available supply of hides will soon be required for shoes and similar products.

WILLARD BUYS A COLE EIGHT.

Jess Willard, champion heavyweight pugilist of the world, has bought a Cole Eight and bought it with a dispatch that "took away the breaths" of the most blase of the Cole company's officials, as they relate.

While Willard was in Indianapolis with the wild west show with which he exhibited, an unknown friend of the Cole company telephoned that the champion would that day visit the local automobile makers with a view of purchasing a



The Cole Eight Being Demonstrated to Jess Willard on Circus Grounds—(Insert) The Heavyweight Champion.

car for Mrs. Willard. The hint was heeded, and two Cole representatives were on the circus lot with a Cole Eight in record time. After demonstrating the car they took Willard to the factory to view the machines, etc., that make the Cole cars. Without the customary parley and without visiting the other makers, Willard asked the price, paid it in full from a large roll of bills, arranged for delivery from the Cole dealer in Los Angeles, and left the Cole officials amazed at the rapidity with which the sale had been made.

Porto Rico has 2000 motor cars. Last year 548 cars, all American, were imported.

MOTOR CAR A SAVER ON RURAL ROUTES.

THE postmaster-general has authorized more than 500 automobile rural routes, 320 of which are now in operation. Experience so far has shown that time schedules are better maintained and that mail is handled more efficiently.

In some cases carriers, with 24 to 30-mile routes laid out for horses, have adopted motor cars and have been operating them on the salaries paid for horse service.

They will receive \$1800 a year and are required to furnish their own cars. These cars will be standardized. The government is furnishing blue prints of the standard body which must be used.

The cost to a Kansas carrier who has been using a motor car on his horse route, is given as follows:

Set of tires (average life 6000 miles.....)	\$60
Gasoline (one gallon to 15 miles, at 15 cents a gallon, though he is now paying 11 cents).....	60
Oil (one gallon to every 150 miles at 45 cents a gallon)	18
Depreciation (based on 72,000 miles as the life of his car)	40
Repairs per 6000 miles	30

Cost of operation per 6000 miles.....\$208

From the above the cost of operation per mile comes to \$0.3466. Applying this figure to his 29½-mile route, this carrier found this to be his outgo for running expenses:

To serve route 250 days by auto at \$1.02 per day.....	\$255.00
To hire horse and conveyance at \$1.50 a day for 57 days, or during the period which he could not use the machine	85.50

Cost to serve route.....\$340.50

Deducting \$340.50 from his \$1200 salary, the carrier's net income now is \$859.50. Applied to a 55-mile route, it works out thus:

To serve route 250 days.....	\$477.50
To hire substitute at \$3.33 a day to cover that part of route which the regular carrier could not do by horse drawn conveyance during the period in which he could not use his machine, and to hire horse and conveyance at \$1.50 a day to do the remaining half of the route for 57 days....	270.50

Total cost of serving the long route.....\$758.00

Hence, this carrier, if he received \$1800 a year for covering 55 miles six days a week, figures that his net income would be \$1042—or \$200 more than he is now getting.

SAXON ROADSTER SET NEW RECORD.

In a non-stop run over Colorado roads a Saxon roadster averaged more than 20 miles an hour

in 200 miles of continuous running, and went 102 miles more at an average speed of 30 miles an hour.

The test was made to settle a wager and the car was run by two sets of drivers and observers. The total amount of gasoline consumed was 11.06 gallons, or 27.3 miles to the gallon, which in view of the high Colorado altitudes in which the motor was operated and the extra fast speed at which the car was driven, is considered a remarkable demonstration. Two quarts of oil were used.

MANY LONG DISTANCE TOURISTS.

On a certain bridge over the Mystic river, between Medford and Somerville, the Massachusetts Metropolitan Park Commission has been taking a census of the traffic to determine what portion of the cost of repairs for the bridge should be charged against certain towns.

The period of the census has not yet been concluded, but some very interesting data have been gathered: Of 26,000 cars, not including motor trucks or omnibuses, which crossed the bridge, 2000 came from other states. New York had 426, Rhode Island 338, Illinois 34, California seven, Florida 10, Mississippi four, Wisconsin three. Louisiana, Minnesota, Oklahoma, South Dakota, Tennessee, Utah, Wyoming and Washington were the only states not represented at all. Cars from those states had doubtless passed the bridge at other times during the summer.

This is a striking demonstration of the universality of the automobile. A great many of the visitors would probably not have been there at all except for the inducement to travel which the motor car furnishes.

MASSACHUSETTS LICENSES LIMITED.

Licenses to drive motor cars in Massachusetts are to be limited to the type of car in which the driver makes his test. If the car has a planetary transmission, the driver is given a license only for that kind of car; the same is true with the friction disc transmission. If a driver wants a general license he must furnish for the test a car with a sliding gear transmission.



THE Great Western "Light Six," which is the only machine built this year by the Great Western Automobile Company, Peru, Ind., is intended to take the place of the four-cylinder car which was known as the "Hill Climber." It is designed to be very light, it has been fitted with all the conveniences found in larger and more expensive cars, it rides easily and it is economical of operation and maintenance.

The six-cylinder motor is an L head type, the cylinders having bore of three inches and stroke of five inches, cast en bloc. The material is a high-grade of gray iron and the walls are machined to a uniform thickness, which decreases weight and affords high cooling efficiency.

The aluminum alloy crank case is in two parts, the upper half carrying the main bearings and crankshaft, while the lower half is the oil reservoir. This basin can be quickly lowered and the pistons and the connecting rods and these bearings can be easily removed without disturbing the main bearings.

The crankshaft is mounted on three main bearings and is exceptionally large in diameter and very rigid. The valve mechanism is entirely enclosed. The valves are at the right side. The valve tappets are a mushroom type. The valves are $1\frac{5}{8}$ inches over the head, $1\frac{3}{8}$ inches in the clear and have a $\frac{5}{16}$ -inch lift.

An automatic float feed carburetor is used, which is jacketed with hot water for cold weather starting and to insure fuel economy. It

is adjustable from the seat. The ignition is by a generator, the current being stepped from the battery to high voltage by a Remy coil and distributed by a Remy distributor.

Cooling and Lubricating Systems.

Cooling is accomplished by a special Great Western radiator of the honeycomb type and an adjustable fan. The water is circulated by a centrifugal pump located at the left side of the motor.

The oiling system is a special patented type of combination constant level splash and forced feed. The camshaft is enclosed in an oil tight case and the oil is delivered to this under pressure and then distributed to the various parts of the motor. By the expedient of maintaining oil pressure around the camshaft the valve tappets are held in contact with the valve stems and no matter what lost motion there may be all noise from the valve tappets is eliminated.

The clutch is a multiple dry disc type, which engages with remarkable smoothness, and behind it is a three-speed sliding gear transmission gearset. The gear shift lever is in the centre of the footboard.

Axles, Brakes and Springs.

The three-quarter floating rear axle has heat treated nickel steel shafts carried on Hyatt roller bearings. The gear ratio is four to one. There are two universal joints in the driving shaft. The front axle is a drop forged nickel steel I beam section. There are $\frac{5}{8}$ -inch steel ball bearings

inside and $\frac{1}{2}$ -inch steel ball bearings outside.

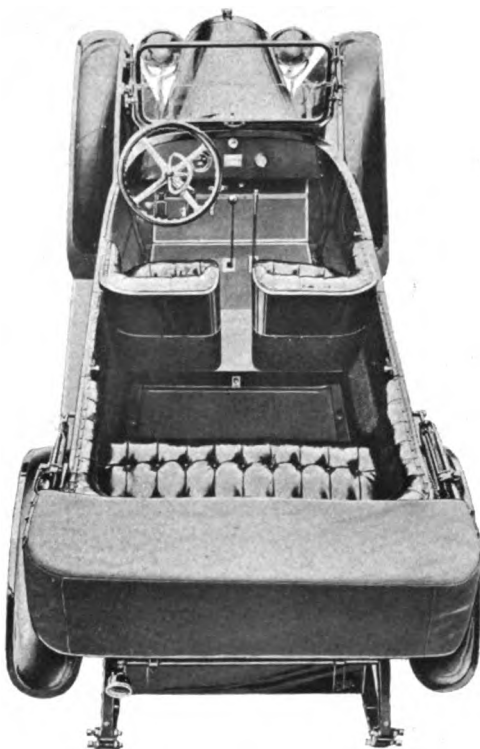
Both sets of brakes act on the same rear wheel drums. The service brake is internal expanding and operates on the inside of the drums, while the external contracting bands of the emergency brake are operated by a hand lever. The brake drums are 12 inches diameter and two inches width.

The front springs are semi-elliptic, 38 inches long and two inches wide, and the rear set, which is underslung, is 51 inches long and two inches wide. The frame is a pressed steel straight side four-inch channel section with three cross members. The frame is curved over the rear axle to obtain low body suspension and a low centre of gravity. It is inswept at the front to secure a short turning radius.

The wheelbase is 118 inches. The artillery type wheels have 12 spokes and large hub flanges. The tires are Goodyear or Firestone, straight side smooth tread 33 by four inches. For a car of this weight 32 by $3\frac{1}{2}$ -inch tires are commonly used, but this size may be fitted to this car. The tires are considerably oversize.

Full Streamline Body.

The body is a stream or boat line type. Sheet steel is used over an ash frame. The doors have



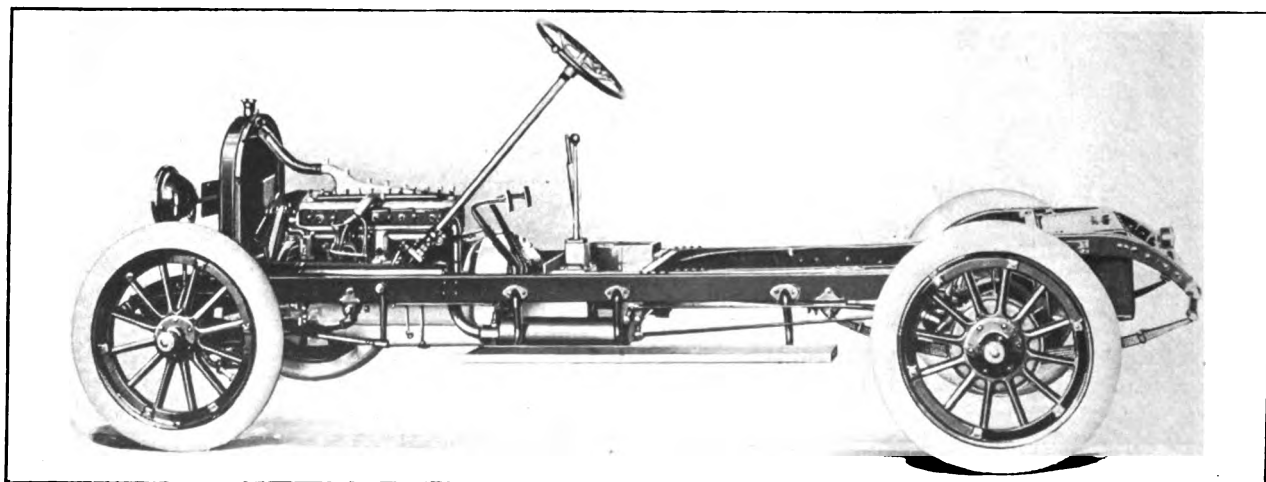
Interior View of the Great Western Light Six, Showing Aisle Between Front Seats, and Compartment in Floor of Tonneau.

flush panels and are fitted with concealed latches and hinges. There is a large leather pocket in each door. Deep Turkish upholstery, having deep coiled springs of special construction and the best quality of curled hair. The lower half of the back of the front seat and the lower part of all doors is covered with Wilton carpet to prevent scuffing. The standard color is Great Western blue with black wheels and black fenders.

The gasoline tank is carried under the rear of the body, where it may be filled without disturbing any of the passengers. It has a capacity of 20 gallons and is fitted with an accurate gasoline gauge.

The car is electrically lighted and started. The headlights are fitted with 16 and four-candlepower bulbs for country or city driving. A small enclosed lamp on the dash illuminates the driver's compartment. The storage battery, which is charged by the generator, is locked under the floorboards of the driver's compartment, where it is easily accessible.

Starting and lighting is by a Detroit Ward-Leonard single-unit motor-generator, which is mounted on the right side of the motor. It is connected with the crankshaft by a silent chain



Chassis View of the Great Western Light Six, Showing Low Hung Design and the Underslung Rear Springs.

drive running in oil. The starting switch is located on the toe board in the driver's compartment and is operated by the foot.

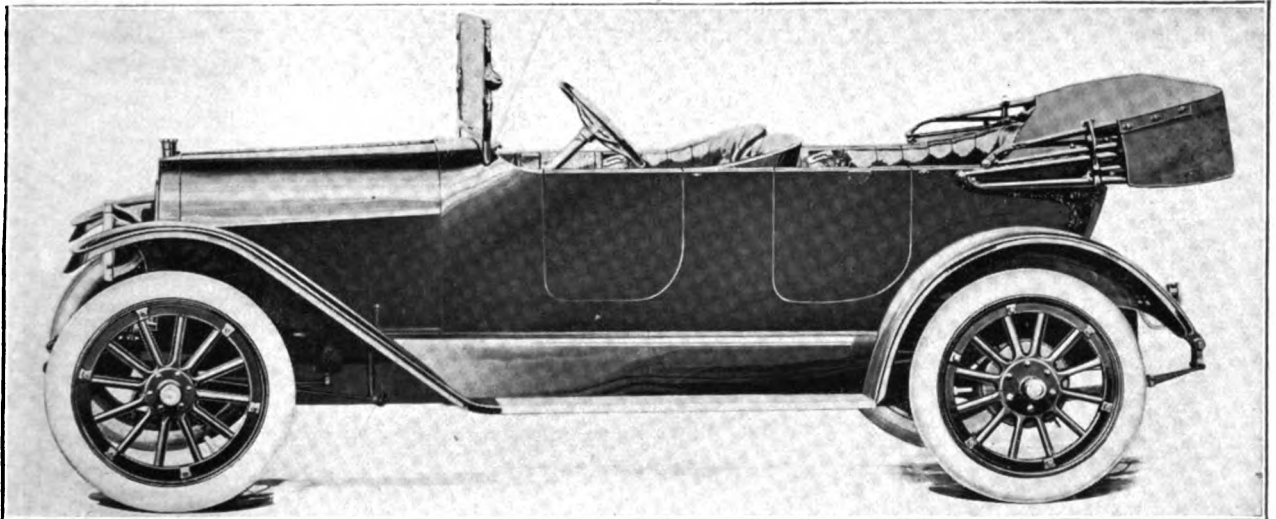
The steering column is at the left side of the car, and is set at an angle that permits the greatest ease of movement and convenience for the driver. The car can be entered from either side. The control levers are in the centre of the car and are easily reached, but they do not obstruct ingress or egress from the front seat. The clutch pedal is operated by the left foot, the brake pedal by right foot, the starter pedal by right foot and the accelerator by the right foot.

The windshield is a rain vision, ventilating type. A large electric motor driven horn is mounted under the hood. A Stewart magnetic speedometer finished in black and nickel and driven from the transmission gearset, is used.

as a rigid support for the front end of the top. A glass shield is mounted on the top in front of the windshield in such a way that it prevents snow from gathering on the upper glass and obstructing the vision. The interior of the top is lined with cloth and there is a dome light in the centre. The exterior is of weather proof and practically wear proof material. The Olds production schedule for this year is the largest in its history, not excepting 1903, when thousands of the old curved dash runabouts selling at \$650 were made.

MILLER TIRES IN ATLANTA.

The increase in the sale of Miller tires in the South has made it advisable to establish a fac-



The Great Western Light Six, Priced at \$1185, and Having Wheelbase of 118 inches—Standard Finish Is Great Western Blue Black with Black Wheels.

The top is a one-man type, covered with the best quality of fabrikoid. A specially designed tire carrier is attached to the rear of the frame. Other conveniences are a robe rail, dust cover and tube storage compartment, tool compartment, luggage compartment and tire carrier.

OLDS ADOPTS WINTER TOPS.

The Oldsmobile maker has adopted a winter top that can be mounted in a few minutes in the place of a regular top and converts the car into a comfortable limousine. The Olds top can be left on the car all the year around with equal comfort as in summer. The side sills and walls can be removed, leaving the car entirely open. The standard windshield remains in place and serves

tory branch of the Miller Rubber Company at 449 Peachtree street, Atlanta, Ga. This will facilitate shipments to points through the South and relieve many dealers of the necessity of carrying such large stocks as they must do now when quick shipments are impossible.

LINCOLN MOVIES READY.

More than 14,000 feet of moving picture film, taken on the recent official ocean-to-ocean tour over the Lincoln highway by C. W. Thomas, are now ready. It is expected that in the neighborhood of 20,000,000 people in all parts of the country will view the pictures, many of which show the most notable features of the Panama-Pacific Exposition.

ELCO "30" FOR 1916 TO SELL AT \$585.

THE Bimel Buggy Company, Sidney, O., which has manufactured animal vehicles since 1844, has designed and placed on the market a five-passenger streamline touring car of 102-inch wheelbase, which will be sold with complete electrical equipment for \$585.

The four-cylinder motor is a Davis production with three-inch bore and four-inch stroke. The cylinders are L head type and are cast en bloc. The multiple disc clutch is integral with the motor unit and the whole is suspended at three points.

The oiling system is a constant level splash with oil rings that carry the lubricant from the reservoir to the main bearings. There is a sight gauge by which the oil level can be determined that is attached to the motor.

The ignition is a generator-battery system, with an Atwater Kent distributor. The carburetor is a Zephyr, with a filter connected to avoid difficulties that might arise through dirty gasoline. It is said to afford a satisfactory fuel supply at all operating conditions. The motor is cooled by water, having thermo syphon circulation through a honeycomb radiator of large capacity.

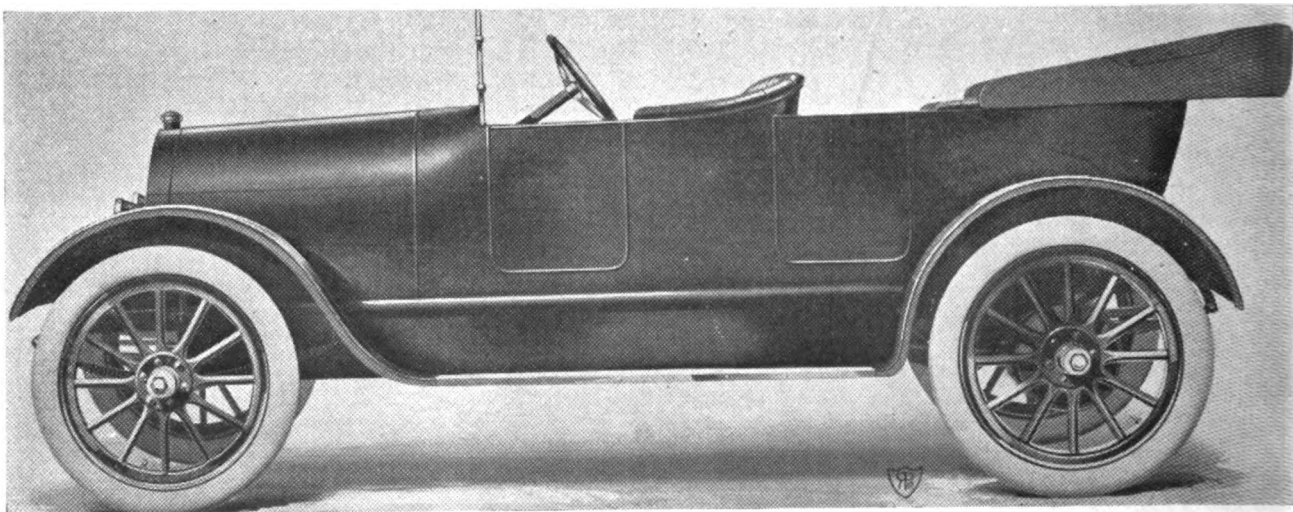
The single-unit Disco electric generator and starting motor is rated at 12 volts and the battery is a Pumpelly. The transmission gearset is a selective sliding gear construction, with three forward speed ratios and reverse. The direct drive is on high speed. There is a thrust bearing on

the drive shaft. There is one universal joint in the drive shaft contained in a grease-tight four-inch globe.

The rear axle is a late design, without truss rod, and with $1\frac{1}{8}$ -inch spindles, having a pressed steel housing. The frame is pressed steel, three inches by $1\frac{1}{2}$ inches, with all parts riveted on. The wheels are artillery type, with $1\frac{1}{4}$ -inch spokes. The rims are clincher demountables and one extra rim with carrier is supplied in the standard equipment. The tread is the standard 56 inches.

The body is a handsome streamline type, constructed of pressed steel. The top is a four-bow, one-man design, with curtains that will fold square. The windshield is a clear vision construction in two parts. There are two electric headlights fitted with dimmers and a tail light. The lamps are enamelled nickel. There is an electric horn mounted under the hood. The weight of the car complete is 1750 pounds. Four tires of plain tread for clincher rims 30 by $3\frac{1}{2}$ inches are supplied. Speedometers are fitted for \$15 extra.

The Bimel Buggy Company for many years distributed its horse vehicles throughout the northern states. In this same territory it has placed cars with many of its agents as samples and there has been a very general approval of the well designed and well equipped machine. T. M. Miller is president and general manager of the company.



The Elco "30," Four-Cylinder, Five-Passenger Touring Car, Priced at \$585.

RESTA MAKES 108 MILES PER HOUR.

AT THE official christening of the Sheepshead bay speedway course, Sept. 18, Dario Resta, the sensational speed king from abroad, again demonstrated that he is the master driver of the 1916 season. In an attempt to establish a record for 10 miles and to feel out the speed possibilities of the track, he sent his Peugeot around the two-mile course at the average rate of 108 miles per hour and broke all records for the distance and course. His official time was five minutes and 32 $\frac{4}{5}$ seconds.

The record that he exceeded, or as nearly as record as exists, was made by himself at Chicago in a match race when he did the first 10 miles of the 100 scheduled in five minutes and 57.70 seconds.

On the straightaways, Resta claimed that he attained a speed of 114 miles an hour, and hinted that he could have done better by making the statement that the track is good for 130 miles an hour. The course measures two miles to a lap and Resta's time for each was as follows: First, 1:06 $\frac{3}{5}$; second, 1:06 $\frac{4}{5}$; third, 1:06 $\frac{3}{5}$; fourth, 1:06 $\frac{3}{5}$; fifth, 1:06 $\frac{2}{5}$.

The occasion was the christening of the speedway, which began with a monster parade through Manhattan and Brooklyn, the cavalcade of automobiles gathering in volume as it passed along until there were fully 5000 automobiles in line.

The majority of them were decorated. Three prize winners for decorations were Chandler, Marathon and Oldsmobile cars.

The events presage record breaking speed in the race on Oct. 2.

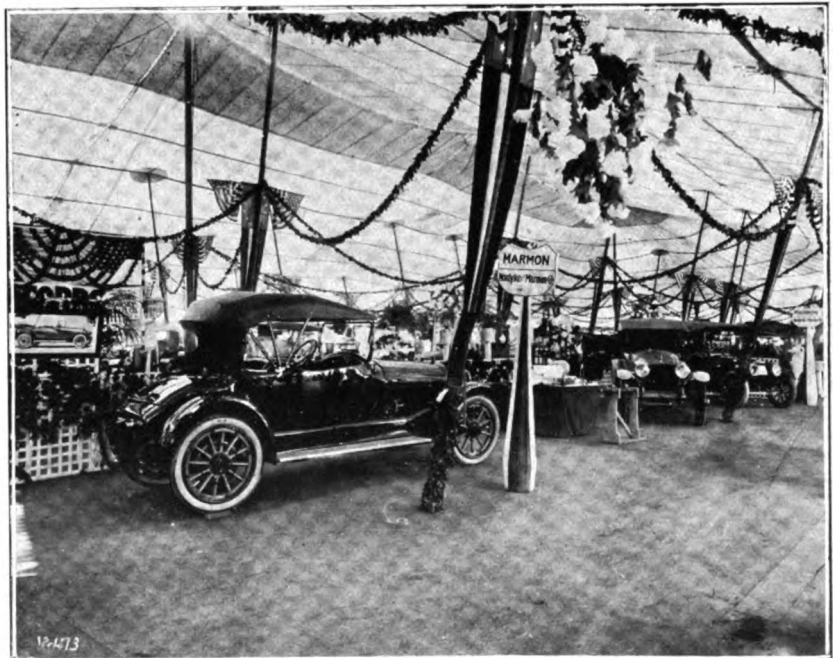
STATE FAIR AUTOMOBILE SHOWS.

Automobile exhibits as a part of state fairs are increasing in prevalence and popularity throughout the country. They are being conducted in the majority of cases with better organization and forethought than heretofore, and are meeting with greater approval by the inhabitants of the rural districts, who seldom if ever

attend the big shows in the metropolises.

The view shown in the accompanying illustration is that of the exhibit under canvas at the Indiana state fair, held under the auspices of the Indianapolis Automobile Trade Association. There were about 60 exhibitors, each of whom showed on the average of four cars, the total value of which approximated \$750,000. These cars were 1916 models, which were shown for the first time to Indiana motor car enthusiasts, about 100,000 of whom attended the exhibit.

The exhibitors were nearly unanimous in the



Marmon Exhibit at the Indiana State Fair—Model 41 Roadster in the Foreground.

belief that more benefit accrues to the manufacturer from these state fair shows than from the comparatively few larger shows in larger cities. The rural states are buying the larger proportion of the cars made, and by these shows the maker can reach directly the small business man and the farmer, who constitute the backbone of the industry today.

Plans for a permanent building at Indianapolis are under consideration and the Indiana State Board of Agriculture will be petitioned for such a structure. One of the arguments will be that the motor vehicle is regarded by the farmer with almost as much interest as live stock or agricultural implements.

PRACTICAL MOTOR CAR REPAIRS.

CONDITIONS may necessitate keeping all gates and doors of garage and repair shop closed, but adapted so they may be readily opened

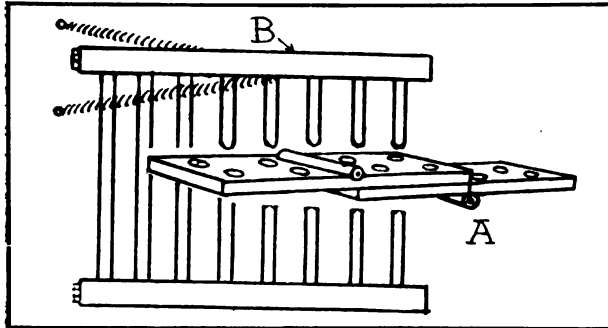


Fig. 88—A, Arrangement of Hinges for a Double Swinging Door or Gate; B, Spring Adjustment for a Gate.

by workmen without laying down articles they may be carrying to release the knob or hook. A double swinging hinge may be made by obtaining four butts and riveting them in pairs, the back being together, as shown in 88 A. Of course the end of the door or gate should be recessed to admit the extra thickness. A small coil spring can be attached to each side of the door and if the tension is equal the door will remain closed at all times, as shown in Fig. 88 B.

STRAIGHTENING A BENT FRAME.

Several methods are extensively used for straightening bent frames, but the best results can be obtained by gradually bending the metal back to shape, rather than striking it with the hammer. Apply a blow torch to the point of bend until the metal becomes red hot. Now adjust a large wrench to the end of the frame, as shown in Fig 89 A, and straighten by a

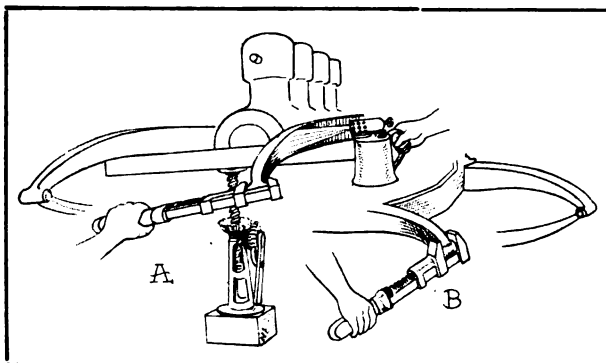


Fig. 89—A, Straightening a Bent Frame After Heating; B, Truing up the Member with a Wrench.

steady pressure. If it is now found that the part is not absolutely parallel with the corresponding part, it may be trued up by applying the wrench as shown in Fig. B.

HOME-MADE CARBURETOR HEATER.

Perfect carburetion of present-day fuels is almost impossible in cold weather on some of the earlier makes of cars that have no provision for warming the air supplied to the carburetor. However, a practical heater can be made by the average person, as shown at Fig. 90. The chief unit of the heater is a tin can in each end of which is scribed a circle of the diameter of the exhaust pipe to which it is to be attached, and within this circle another is scribed, as indicated at A. With tin shears cut away the metal sug-

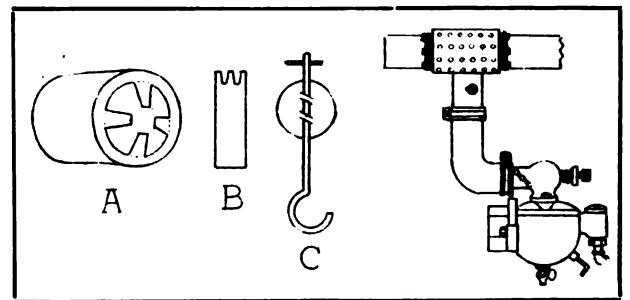


Fig. 90—The Components of the Home-Made Carburetor Heater and How It Is Assembled.

gested by the dotted lines, leaving the four lips shown by the black line. Next "stagger" the end of a light metal tube, as shown at B, and insert this in the side of the can through a hole drilled to the diameter of the tube. Turn down the lips of the tube within the can and rivet them for security. The extemporized heater is now complete. To install, either remove the exhaust pipe or slit the can and slip it over the pipe, making it secure by bending the four lips outward and wiring tightly to the exhaust pipe. Communication between the heater and carburetor can be established by fitting a good grade of rubber hose—the wire kind is preferable inasmuch as it will not kink readily. Of course it is necessary to have a number of perforations in the heater to admit the air, which can be regulated by the use of a butterfly valve inserted in the tube, the construction of which is shown at C. It is probable that after installation of the heater, the air inlet of the carburetor will require adjustment.

SIMPLE MOTOR AMBULANCE.

In garages that specialize on all types of

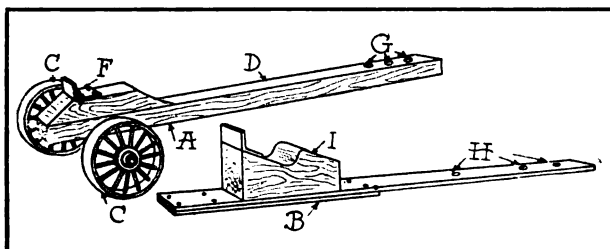


Fig. 91—Diagram Showing How to Make a Simple Motor Ambulance.

emergency repairs, the device shown in Fig. 91 can be advantageously adopted. It is designed to be placed under the rear housing of a car having a broken axle, so that it may be easily towed.

Heavy metal wheels (C) should be used and they should be at least 12 inches in diameter and as wide as possible. A tongue made of pine board (D) and about 12 feet long is saddled to the wheels as shown. An extra thickness of board (E) is attached to the extreme end so as to maintain the proper height of the car. At this end is also attached a strong metal hook (F) so as to prevent the housing from slipping. The other end of the tongue, of course, attaches to the front axle. As tie rods are likely to make attachment difficult, it is advisable to drill holes (G) at the end of the tongue so that the ambulance may be secured to the front axle by chains.

It is obvious that this device can also be used should the front wheels be damaged.

Another towing device is shown herewith. A strip of thick sheet steel (H), which is about 15 feet in length and 12 inches in width, is made similar to the one described above, except that it has no wheels and slides along the ground. A wood saddle (I) is bolted to the end and an extra thickness of sheet steel (J) placed at the bottom to protect the bolts. Holes are, of course, drilled at the end of the strip for attachment to the front axle.

BRAZING.

Brazing is the process of joining two metals together by a film of brass. The metal is brought to a red heat by a blow torch or other means and then borax is used as a flux to dissolve all oxides forming on the metal. It is imperative before commencing the process to thoroughly clean the two parts to be joined and to shape them so that they can be securely held together by clamps or

bolts. This is necessary, as the work must be turned over several times if a good repair is to be made. When the film of brass has formed in the crack, the piece should be instantly withdrawn from the flame and plunged into a water bath.

STRENGTHENING THE CAR FRAME.

On several cars of the lighter type much strength can be added to the frame of the car by attaching a cross bar similar to that shown in Fig. 92. Place a plank under the front portion of the frame and release the weight from the forward springs by a jack, as illustrated at A. Remove the spring bolts at the extreme end of the frame. Thread the ends of a steel rod of the same diameter as the bolts removed and of sufficient length to extend for about an inch on both sides of the frame, as shown at B. At the extreme end a small hole can be drilled to admit a cotter pin for locking purposes. Slip over the rod a piece of steel tubing of sufficient length to fit snugly between the frame, as shown at C. The assembly of the parts is clearly shown in the illustration. If required the cotter pin can be omitted at the end of the rod and provision made for the attaching of a grease cup. This is shown at D.

BABBIT METAL.

Before pouring babbitt metal, drop a piece of rosin about the size of a marble in the metal and then skim off the surface. Experienced workmen state that this improves the quality of the metal and allows it to run better. It is also claimed that the rosin will prevent blowing when pouring into damp boxes.

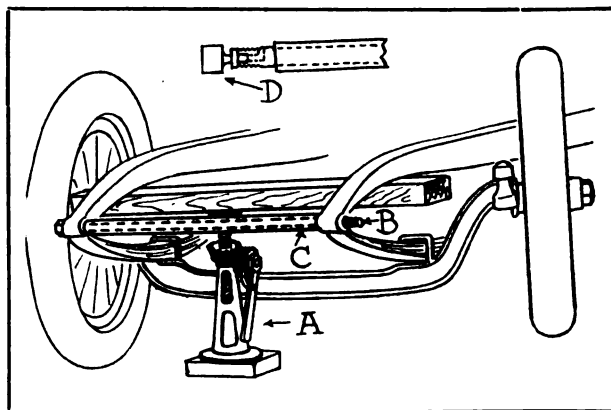


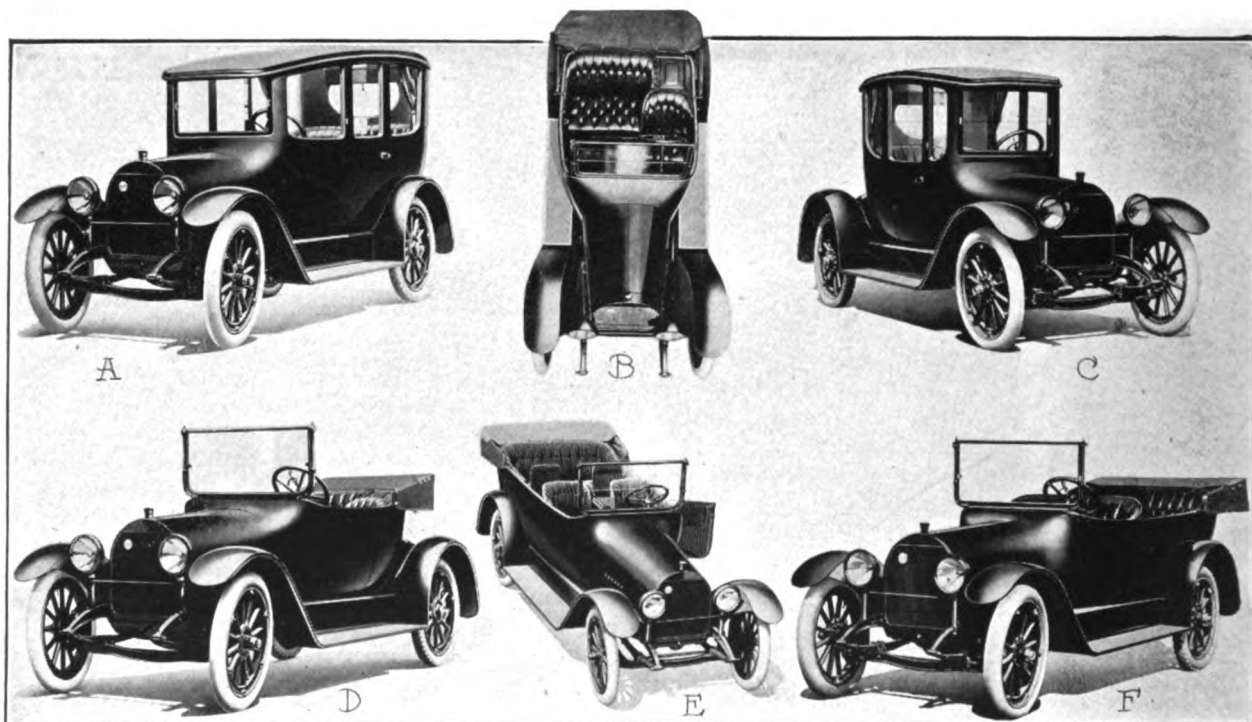
Fig. 92—A, Position of Jack to Relieve Springs of Weight; B, How Rod Is Inserted; C, Covering Tube; D, Grease Cup.

KISSELKAR LINE INCLUDES FOURTEEN BODIES.

One Four-Cylinder Model Added and Two Six-Cylinder Models Dropped—Prices Reduced Considerably for 1916.

KISSELKARS in the past have had distinction because of the body designs. For the 1916 season the maker, the Kissel Motor Car Company, Hartford, Wis., has developed 14 different styles of bodies which range from the boat-shaped roadster model to the enclosed coupe and sedan designs. These bodies are intended to be mounted on three chassis of the same design.

three sixes and a four. The most conspicuous machine of the new list is the High Efficiency 32-Four, listing at \$1050, which is a remarkably low price for KisselKars. The other four-cylinder model, the 36-Four, which is continued from last season, has been reduced in price from \$1450 to \$1250. The second of the older models, the 42-Six, is offered for 1916 in a new touring model and priced at \$1485.



Six KisselKar Body Designs for 1916—A, the All-Year Sedan Detachable Top Mounted on Model 36-Four; B, New KisselKar Four-Passenger Roadster Mounted on All Chassis; C, the All-Year Coupe Detachable Top Mounted on Model 32-Four; D, Showing Graceful Lines of the Four-Passenger Roadster; E, Seven-Passenger 42-Six with De Luxe Corridor Body; F, 42-Six, Five-Passenger, Four-Door Touring Body.

Other outstanding facts in the KisselKar announcement is the debut of the new four-cylinder model 32, the abandonment of the 6-48 and 6-60 models, and a general and considerable reduction in prices. The success of the All-Year KisselKar in 1915 has, in the opinion of the builder, warranted a new design of detachable coupe top and a general refinement of all bodies.

In chassis, the new 1916 line includes two four-cylinder and one six-cylinder, instead of

The full membership of the KisselKar "family" for 1916 is given in the following list:

32 High Efficiency Four five-passenger four-door touring	\$1050
32 High Efficiency Four Special four-passenger roadster	1150
36-Four five-passenger two-door touring.....	1250
36-Four roadster	1250
42-Six five-passenger four-door touring.....	1485
42-Six seven-passenger four-door touring with over-sized tires	1585
42-Six four-passenger roadster.....	1650
42-Six five-passenger two-door de luxe touring....	1650

42-Six seven-passenger three-door de luxe touring with oversized tires.....	1750
32 High Efficiency Four with Detachable Coupe Top.....	1450
36-Four with Detachable Coupe Top.....	1550
36-Four with Detachable Sedan Top.....	1600
42-Six with Detachable Coupe Top.....	1950
42-Six with Detachable Sedan Top.....	2000

All three KisselKar chassis are practically standardized. They have L head motors, cast en bloc, which are built in the Kissel company's Hartford plant; cone clutches, three-speed transmission gearsets and are driven by double jointed shaft and have floating rear axles.

The new model, the 32-Four, has a high-speed motor, with $3\frac{7}{8}$ -inch bore and $5\frac{1}{2}$ -inch stroke. The 36-Four motor has a bore of $4\frac{1}{4}$ inches and stroke of $5\frac{1}{2}$ inches, and the 42-Six motor has a bore of $3\frac{5}{8}$ inches and a stroke of $5\frac{1}{2}$ inches. The wheelbase measurements are 115 inches, 121 inches and 126 inches, respectively. The 32-Four chassis has 33 by four-inch tires, and the two other models have 35 by $4\frac{1}{2}$ -inch tires.

Westinghouse dual ignition and lighting system are fitted to the two four-cylinder chassis, while a three-unit starting, lighting and ignition system of a high-tension magneto type is used for equipment of the six-cylinder chassis. The starter of all chassis is the successful Kissel design.

In other mechanical details all chassis are alike, and one description will suffice. The three-bearing engine crankshafts are mounted on Fahrigr metal bearings. The pistons, rods, etc., follow conventional practise. A Stromberg carburetor is fed by a patent vacuum tank. Lubrication is by constant level splash and the cooling water is circulated by a centrifugal pump. The cone clutch is a leather faced and is fitted with adjusting springs.

The front springs are semi-elliptic, the rear springs are three-quarter elliptic and both sets are guaranteed against centre breakage during the life of the car.

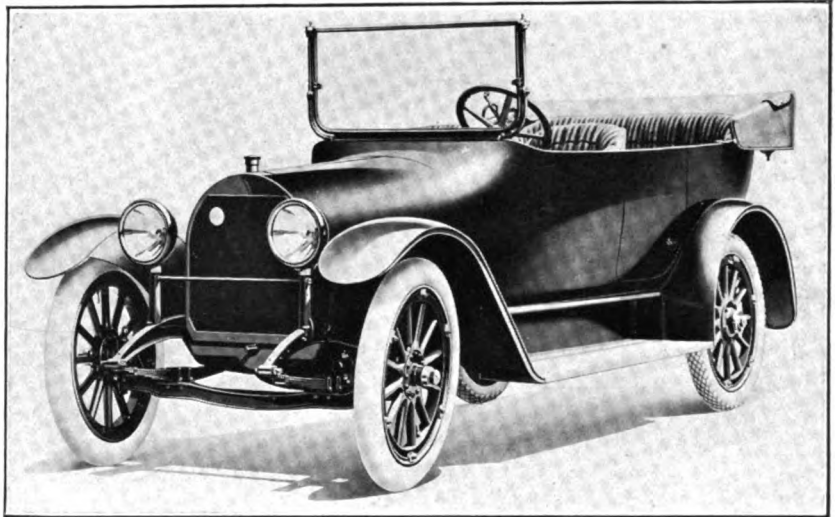
Other mechanical characteristics common to all models include Kissel built front and rear axles, full floating rear axles, independent foot and emergency brakes with four external contracting bands on wheel drums 14 inches diameter and two-inch face; L. B. A. storage battery with electric wires centralized on dash panel; Mayo or Fedders radiators with positive circula-

tion by centrifugal pump; aluminum crank case; spiral bevel gears; split nut and worm type steering gear with adjustable ball bearings and 18-inch steering wheel; 20-gallon gasoline supply tank with illuminated gauge.

Characteristics of the Body Designs.

Great interest attaches to the body designs. The open bodies show a tendency toward the boat lines that are so popular of late. One notable feature is that the radiator has been narrowed slightly, sufficient to allow a sweeping curve to the cowl.

In developing the detachable tops, the Kissel-Kar designers have worked to build a top whose junction with the permanent body is scarcely noticeable. In the coupe model the junction is hardly discernable by even the expert and the



KisselKar 42-Six with Three-Door, Seven-Passenger Touring Body with Special Upholstering.

average person would believe the car to be strictly a coupe model.

The tops, both coupe and sedan, are attached by bolting at 10 points, to heavy steel brackets at six points and to the regular top irons of the touring or roadster models at four points. Heavy white ash and elm have been adapted in the building of the frames of the tops. The window sashes are mahogany. The top frames are covered with sheet steel and aluminum, and the roof is three-ply white wood, covered with canvas.

Features of the Enclosed Bodies.

The windows, six in number for the coupe and eight for the sedan, are set in channel rubber, which makes them water proof even in heavy storms. Window and door panes are of French plate glass. Further refinements are curtains or shades for the windows, centre dome electric

lights, the wiring for which connects automatically by means of spring plungers as the top is placed in position, and choice of either leather or cloth of special material for the upholstery.

The body styles afford a wide range of choice. The 32-Four chassis is equipped with a four-door, five-passenger touring body, and a four-passenger roadster specially built to mount the detachable coupe top. This roadster body is obtainable for the other chassis. The driver's seat, at the left, is set forward about a foot from the two-passenger seat, while the fourth passenger uses a removable chair located near the driver. The storage space is ample.

The conventional four-door touring body for either five or seven passengers is equipment for both the 32-Four and 42-Six chassis. The last named can also be obtained with the special two and three-door Kissel corridor designs, with individual forward seats. The corridor design body is built very strongly to support the detachable sedan top.

The 36-Four type is presented in only one touring tonneau style—the two-door corridor car introduced by Kissel last year as the "yacht line body"—so-called because of the unbroken surface from radiator to midships, as well as its distinctive lines.

All bodies are equipped with a two-piece ventilating windshield, demountable rims, a Kissel "one man" top and cover, quick adjustable side curtains, lock-on ignition, an illuminated instrument board, speedometer, electric indicator, adjustable tire irons, motor operated warning signal and the usual tools.

MARMON GOES THROUGH ON HIGH.

W. L. Betz, Jr., of Bicknell, Ind., recently drove a Marmon 41 from Indianapolis to Baltimore without having to go out of high gear on any hill he encountered. In the matter of tires and fuel, he claims the Marmon averaged 12½ miles to a gallon, and that he has not been obliged to touch a tire since he has owned the car, which he had at that time run over 2100 miles.

HYATT OFFERS \$1000 IN GOLD.

"How far has your car run on Hyatt quiet bearings?" is the question propounded by the Hyatt Roller Bearing Company in the endeavor to obtain a wide variety of engineering data for its library. The company is willing to pay \$1000 for the information, the money to be distributed

as prizes for the best answers as follows: First, \$500; second, \$200; third, \$100; fourth, \$50; fifth, \$30; sixth, \$20; next 10, \$10 each.

The official entry form, which each contestant for prizes must have, can be obtained from the company, at 700 Woodward avenue, Detroit, Mich. The contest closes Nov. 1.

THE OBSOLETE CAR SERVICE.

Motorists owning cars, the manufacturers of which have suspended business, can now obtain repair parts from the Puritan Machine Company, Detroit, Mich. That company has bought up the stocks, tools, blue prints, patterns, etc., of more than 60 defunct cars, and now has about 2,000,000 auto parts on hand. Among the more prominent cars are the following:

Aerocar, Anhut, Abbott-Detroit, Barnes, Blomstrom, California, Cutting, Carter-H. Crescent, Dart, De Luxe, Demot, Elmore, F. A. L., Grabowsky, Herreshoff, Krit, Marquette, Michigan, Northern, Ohio Car, Omaha, Queen, Ranier, Reliable Dayton, Southern, Warren, Wayne, Welch and several others.

SCRIPPS-BOOTH FOR FRANCE.

The Scripps-Booth light car has made a sensation in Europe. Peter's & Sons, Ltd., of London, the European representative, has ordered 3000 for disposal by their Paris branch during the coming year. This is an old English coach making concern which has been coach builder to English kings for 125 years. In automobile lines it has handled only such cars as Turcat-Mery et Cie, Marseilles and Austin. The smart design and quality appeal of the Scripps-Booth determined the company to make that its light car.

KING IN SEALED GEAR TEST.

A King Eight was recently driven through the Sacramento and San Joaquin valleys in California with the gear box sealed in high and the shifting lever removed. The car went through ruts, sand and dirt to the axles, and crossed streams and two difficult mountain passes. It passed through 50 northern California towns and threaded the dense traffic and hills of San Francisco. Although the trip was originally planned for 800 miles, the speedometer reading at the end was 900 miles, on account of many detours.

REO MAKES NO RADICAL CHANGES.

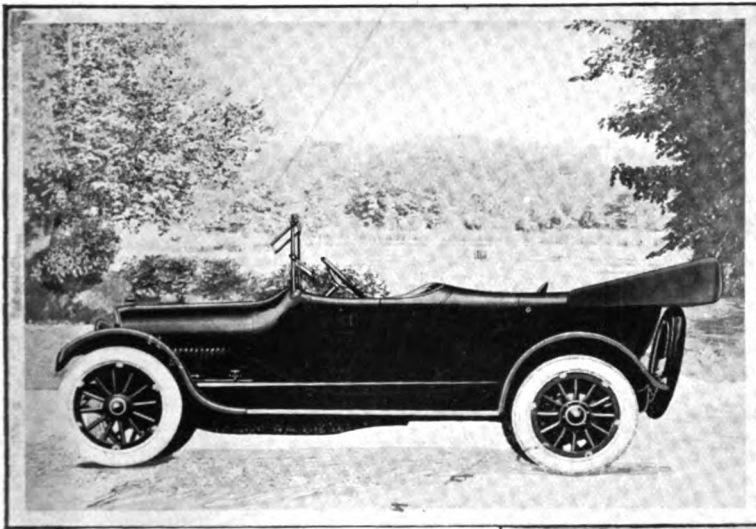
Four and Six of Last Year Are Continued at Lower Prices and With Many Distinctive Refinements in Body Details.

IN A year when radical changes have been made in chassis design by many makers, the Reo Motor Car Company of Lansing, Mich., will continue its Reo the Fifth, four-cylinder model, and its six-cylinder cars unchanged in essentials, but with many refinements in the chassis and improvements in the bodies.

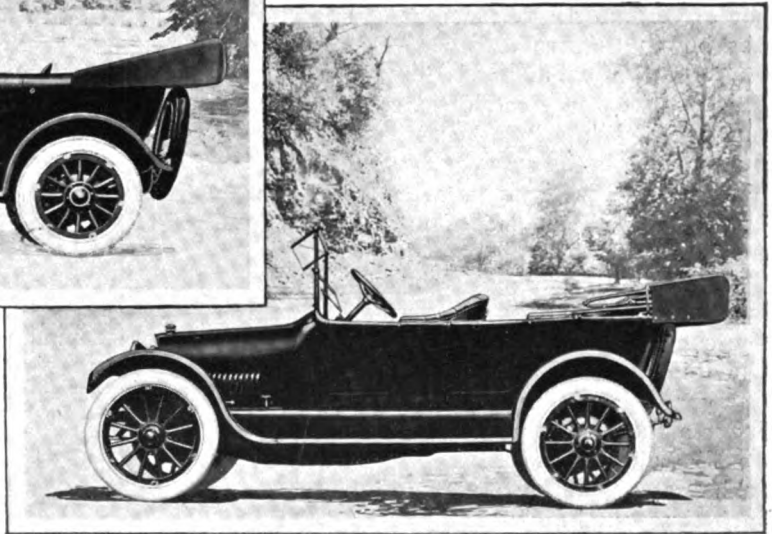
The price of the four-cylinder car is reduced \$175 to \$875 and the price of the six-cylinder \$135 to \$1250. In the designs of the chassis the

but aluminum covers are used on the six-cylinder motor. The valve tappets are light, hollow structures and the tops of the adjusting screws contain pads of soft material bearing against mushrooms on lower ends of the long push rod. The rockers are made with a large oil cup integral, a felt pad being used to absorb the lubricant, which is preferably a soft grease, and to conduct it to the pin bearing of the rocker and the head of the push rod. A unique feature is the use of a fiber roller to join the valve stem and the operating extremity of the rocker.

The motor design is unusual in that the intake valves are located in the cylinder heads, while the exhaust valves are on the right side. Lubrication is by the widely approved com-



The Two Reo Models for 1916—At the Top, the Reo Six-Cylinder Model; at the Bottom, the Reo Fifth, a Four-Cylinder Model—Chassis Design Remains Practically the Same as Last Year, but Many Body Refinements Have Been Developed—Note the Rolled Edge of the Top on the Six-Cylinder Model, Which Imparts A Decidedly Distinctive Appearance.



two cars are much alike, but the six-cylinder chassis body has many features which it has not been possible to include in the four-cylinder car at the lower price.

The four-cylinder motor has cylinders with $4\frac{1}{8}$ -inch bore and $4\frac{1}{2}$ -inch stroke, the cylinders being cast in pairs. The six-cylinder motor has bore of $3\frac{9}{16}$ inches and stroke of $5\frac{1}{8}$ inches, the cylinder units being cast in threes. Both motors are made in the Reo shops. In the four-cylinder engine the valve rockers are not encased,

but aluminum covers are used on the six-cylinder motor. The valve tappets are light, hollow structures and the tops of the adjusting screws contain pads of soft material bearing against mushrooms on lower ends of the long push rod. The rockers are made with a large oil cup integral, a felt pad being used to absorb the lubricant, which is preferably a soft grease, and to conduct it to the pin bearing of the rocker and the head of the push rod. A unique feature is the use of a fiber roller to join the valve stem and the operating extremity of the rocker.

The motor design is unusual in that the intake valves are located in the cylinder heads, while the exhaust valves are on the right side. Lubrication is by the widely approved combination forced feed and splash system, in which the three main bearings of the crankshaft are directly supplied from the pump, which also floods the timing gears and the dip troughs for the connecting rods. The system is identical in both motors. The oil pumps have some unusual features. The pumps are plunger types, driven from the camshaft, but unlike many pumps of this design, they are driven by eccentrics with full strap connections to the pump plungers and no spring is used for the suc-

tion stroke. The oil is drawn in at the bottom of the pump cylinder as the plunger rises and is transferred to the interior of the plunger as the latter descends. It passes out through holes in the top of the hollow plunger and goes to the supply pipes. A ball valve at the bottom of the plunger opens only after the intake holes at the bottom of the cylinder are closed by the descending plunger. Adjustment of the amount of oil pumped can be made by raising or lowering the plunger, thus increasing or decreasing its effective stroke. By a screw connection between the plunger and the connecting rod this adjustment is made easily.

Threaded screw bolts are fitted to the crankshaft main bearings so that they can be adjusted, no shims being placed between the edges of the bearing sections.

The ignition is by the Remy generator-battery type system. The lighting generator is mounted at the right side of the motor. The starting motor is a separate unit, which is mounted between the motor and the gear box, which is placed amidships. It cranks through the clutch shaft instead of by the flywheel and there is an ingenious ratchet arrangement by which the drive motor is released as soon as the engine has begun to turn.

Helical Geared Pump Drive.

Opposite the electric generator is the water pump, which is driven by helical cut gears. The pump speed is the same as that of the crankshaft. The radiator is the usual Reo honeycomb type, but it is black instead of metal color that formerly characterized it.

The clutches of both chassis are a dry disc type and the three-speed gearsets are carried in the centre of the frame. The axles are made in the Reo plant. The rear axle of the four-cylinder car is semi-floating and that of the six-cylinder a full floating type.

The wheels are artillery type, with 34 by four-inch tires on the four-cylinder car and 34 by 4½-inch tires on the six-cylinder.

In body design there is no noticeable change in the lines of Reo the Fifth, the four-cylinder car. It has been brought up to date, but no effort has been made to follow current fads. The Reo company believes that the great class of buyers to which this car appeals looks askance at anything unusual because of the rapid deterioration of extreme designs when placed in the used car market.

The six-cylinder body, however, is distinctly classy. It has been created after the internationally famous design of Vanden Plas, a fa-

mous Belgian designer. It is called a "sheer line" body, the phrase being borrowed from yacht design, but the meaning is substantially that given to the term "streamline" by many designers.

All of the four-cylinder chassis are equipped with five-passenger bodies and all the six-cylinder chassis have seven-passenger bodies, all being fitted with disappearing auxiliary seats. The Reo company believes that the line of demarcation in the market between the four and six-cylinder cars just about coincides with the line that divides the five from the seven-passenger demand. The extra power of the six-cylinder type also just about takes care of the extra load.

Divided Front Seats Used.

These bodies are equipped with divided front seats, but there is a step in the space between them, separating the front from the rear compartments. This step is the exterior of a glove box and in addition to being a decided convenience, it prevents wind blowing through the body of the car and disturbing the wearing apparel of feminine passengers. The divided seats afford great advantage when raising the tops or attaching side curtains from inside of the car.

The spark and throttle levers are mounted on top of the steering wheel, contrary to former Reo practise. The electric light switches and the carburetor adjustment are also placed on the steering post, so that the headlights can be dimmed and the fuel supply regulated while driving.

The cowl boards, which were formerly covered with leather, are now metal sheathed in both models. The six-cylinder car wheelbase has been increased from 122 to 126 inches, but in the four-cylinder car the wheelbase remains the same, 115 inches. The springs are cantilever type, as formerly, and are 54¼ inches long at the rear. More and thinner leaves are used, thus improving the riding qualities of the machines.

HUPP FINDS CONDITIONS GOOD.

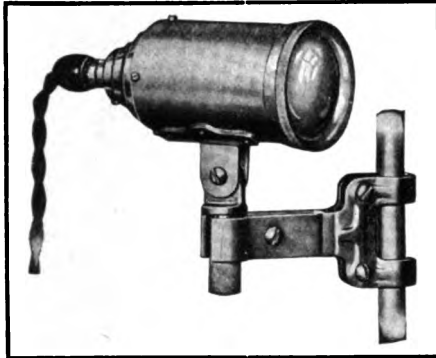
District representatives of the Hupp Motor Car Company gathered at the factory for a conference and reported that business conditions in the automobile and all other lines were rapidly improving in every part of the country and that the problem in the automobile business had again become one of securing deliveries rather than of making sales. Palmer E. Winslow, who for 18 months has been connected with the advertising department of the Hupp company, has become secretary to President J. Walter Drake.

CAR ACCESSORIES AND EQUIPMENT.

PITTSBURG DIRIGIBLE SEARCHLIGHT.

Lamp Attaches to the Rim of the Windshield and Can Be Used on Every Type of Vehicle.

The Pittsburgh dirigible searchlight, shown in the accompanying illustration is made by the Pittsburgh Electric Specialties Company, Pittsburgh, Penn. It is a strongly



Pittsburg Dirigible Searchlight.

constructed lamp, cylindrical in shape, measuring six inches in length and $2\frac{1}{4}$ inches in diameter. It is attached to the side rim of the windshield by means of a bracket arrangement. A universal joint permits it to be turned in any direction. It is equipped with two high-power lenses and a Mazda bulb, which operates on a six-volt current supplied from a dry cell or from the ordinary lighting system. Such a lamp can be used to advantage by every motorist. It makes it possible to easily read side boards or house numbers at night. It is useful in reversing the car and making short turns. When not in use as a searchlight it is easily removable from the windshield and can be used as a trouble light or for illuminating the garage.

AUTO KLEEN.

Paste Which Removes Water Spots, Mud Stains and Blemishes and Restores Original Finish.

The Simons Manufacturing Company, 2121 Michigan avenue, Chicago, Ill., is marketing a scientifically prepared cleansing paste, which is listed under the trade name of Auto Kleen. Absolutely no acid is used in this substance, and it can in no manner injure the surface of the car. On the contrary, it is stated that it will quickly remove stains and oil scums and restore a dull and checked varnish to its original lustre. The brilliant



Simons Auto Kleen for Removing Blemishes and Renovating Varnish.

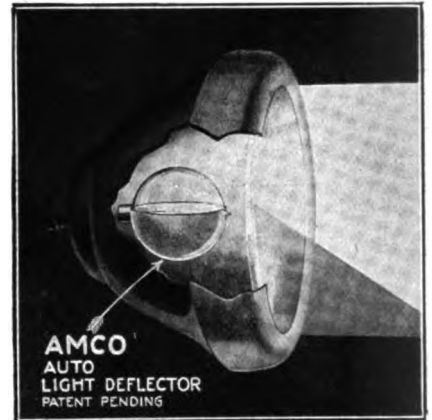
finish will last indefinitely, and dust and other foreign particles cannot adhere to it. Further information will be furnished those who mention this journal.

AMCO AUTO LIGHT DEFLECTOR.

Attachment Which Eliminates the Glare from Electric Headlights and Retains the Powerful Light.

To meet the requirements of safe night driving and yet comply with the dimming laws of many states and cities, the Art Metal Manufacturing Company, 114 Hamilton

avenue, Cleveland, O., is marketing the Amco auto light deflector. It is a small white enamel reflector that is snapped on the lower side of an electric bulb. It deflects all light rays to the upper half of the lamp reflector, from which they are cast outwardly and downwardly, and eliminating all glare. By this principle the strength of the light is not decreased, the road being as well illuminated as before.



A Light Deflector That Conforms to All Laws.

The Amco auto light deflector adequately meets all laws governing headlights and has been highly recommended by experts. The department of Motor Vehicles of the State of New Jersey is one of the latest indorsees. The deflectors retail at \$1 per pair.

Dimming laws are being strictly enforced throughout the country and a wide field for this equipment is being developed. It will, therefore, be to the advantage of dealers and agents to promptly obtain the Art Metal company's selling proposition.

GOODELL-PRATT HACK SAW FRAME.

Long Established Manufacturer Produces a New Design That Is Adjustable and Has a Pistol Grip Handle.

The hack saw frame shown in the accompanying illustration is marketed by the Goodell-Pratt Company, Greenfield, Mass. It is listed as No. 247 and is sold to dealers at \$18 per dozen. The handle is shaped like the butt of a pistol, which affords a very satisfactory grip. It is made of rubberoid and cannot injure the hand. The frame is adjustable and is made from stock, which is $\frac{1}{4}$ of an inch in thickness and $\frac{3}{4}$ of an inch in width. It is finished in highly polished nickel plate. Each frame is

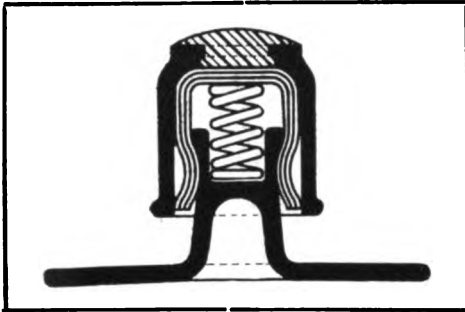


Goodell-Pratt Hack Saw Frame.

fitted with a blade and is ready for use. Inquiries addressed to the maker mentioning The Automobile Journal will bring a reply.

YANKEE SHOCK ABSORBER NO. 10.**Ingenious Spring Arrangement Which Replaces the Common Solid Rubber Bumpers of the Car.**

The Yankee No. 10 shock absorber, shown in the accompanying illustration and manufactured by the Simplex Auto Specialty Company, 731 Woodward avenue, Detroit, Mich., is designed to replace the present solid rubber bumper. A feature of this device is that it is adapted to any make of car and requires but little time to attach.

**No. 10 Yankee Shock Absorber.**

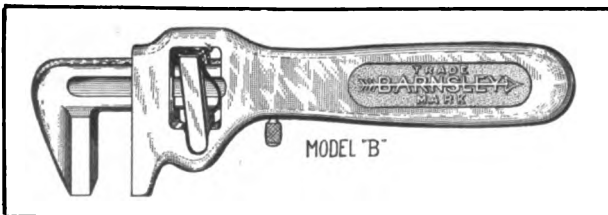
A strong spiral spring is placed under the movable case and fits the top of the standard. Three leaf springs are also arranged under the case and at the sides of the standard. The sides of the standard are set at an angle. As the cup is forced downward by the shock the leaf springs are moved down the angled walls of the standard and are expanded, and, in conjunction with the spiral spring, effectively cushion the shock. This arrangement prevents the breaking and settling of springs from shocks and overloads. The absorber retails at \$3 per pair. Dealers are requested to write to the company and obtain the sales proposition.

The Simplex Company also manufactures shock absorbers for large cars and for Ford cars. The principle employed is somewhat similar to that of the bumper, except that the three-leaf spring remains stationary and a wedge shape plunger is used. When the wheel passes over a depression in the road, the wedge moves downward and causes the leaf-spring to spread and thus cushion the shock. A spiral spring placed under the wedge also helps to absorb the shock. Yankee absorbers for large cars retail at \$12 per pair while a set of four adapted to the Ford sell at \$15.

Yankee bumpers are also manufactured for large cars and for Fords. An absorber designed on the principle described above is placed between the strong channel steel bar and the car. This arrangement affords a cushioning effect, which protects the car from injury, although it may forcibly contact with some other object. The bumpers can be attached to both the front and rear of the car.

BARNSELY CLUTCH WRENCH.**Instantly Adjusted and Automatically Locked to Any Object Within Range of Its Capacity.**

The advantages claimed for the Barnsley wrench, manufactured by the Automatic Wrench Company, 120 Milk street, Boston, Mass., are that it is instantly ad-

**Barnsley Clutch Wrench.**

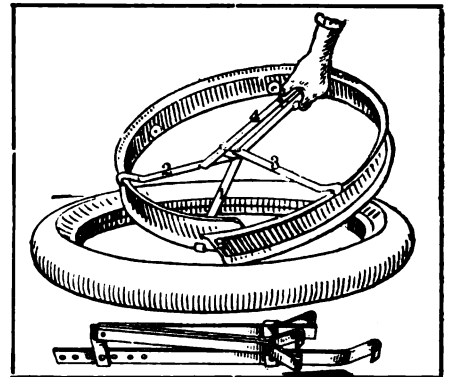
justed and automatically locked at any desired size within the range of its capacity. This action is controlled by the Barnsley clutch, which is the only locking me-

dium used. It is operated by placing the object to be turned within the jaws and then sliding the jaws together with a thumb trigger. The jaws can be immediately released by exerting slight pressure on the clutch. This clutch is unaffected by oil or grease and the tightness of the grip is in proportion to the energy exerted on the wrench handle, the harder the pull the tighter the grip. The wrench shown in the illustration is the 10-inch model B type, which will grip any nut or bolt up to 1 3/4 inches. The retail price is \$1.50. Further particulars will be furnished by the makers to those who mention this publication.

POSITIVE SPLIT RIM REMOVER.**Lever Arrangement Which Quickly Removes Split Rims from Tires by Lapping the Ends Over.**

The Positive Supply Company, Davenport, Ia., is manufacturing a lever arrangement, shown in the accompanying illustration, for the easy and quick removal of

split rims from deflated tires. It is listed as the Positive Split Rim Remover, and is designed to open the rim lock and contract the rim by overlapping the ends so as to permit instant removal. The manufacturer claims that the tool does not cause the rim to bend or spring out of line. It is obvious that this device prevents the cutting of tubes and casings in removing them. It can be adjusted to fit any rim and can be instantly folded and placed in the tool box. The retail price is \$2. The remover is sold with the guarantee that if absolute satisfaction is not derived, the purchase price will be refunded.

**Positive Split Rim Remover.****MAKING ANY CAR A TRACTOR.****The Martin Patent Rocking Fifth Wheel Made in All Sizes to Fit All Vehicles up to 10 Tons Capacity.**

This equipment is produced and sold by C. H. Martin, 293 Bridge street, Springfield, Mass. Its construction includes a cross wise hinge that allows a longitudinal, fore-and-aft rocking motion, which eliminates all stresses due to uneven highways. It is so designed that sufficient of the load weight comes on the rear wheels of the car to insure traction at all times.

While made in all sizes to fit all cars and trucks up to 10 tons capacity, there is a special equipment for Fords. Attached it makes the Ford a tractor that can easily haul 1500 pounds in the trailer. It is easily and quickly attached and just as readily detached, which permits the use of the car for pleasure or business.

With the Martin patent rocking fifth wheel there is no increase to the strain upon the car and it does not increase the cost of operation. The car can be backed to any desired position and any trailer or spring wagon with a body not wider than 46 inches can be used.

The equipment is just as practical in the city as in the country, and it can be utilized in connection with all haulage requirements. It affords all dealers a decided opportunity for a new line of business. The selling price is very moderate and the dealer's proposition extremely liberal. Selling representatives are now being placed. Detailed information will be supplied by Mr. Martin at request.

TOOLS AND EQUIPMENT FOR GARAGES.

PEERLESS AUTOMATIC WATER STILL.

Equipment Which Distills and Purifies Water Regardless of Source or Condition.

Owners of garages and repair shops can increase their source of revenue by installing the Peerless water still, illustrated herewith and produced by the Sparta Manufacturing Company, 111 South Hill Street, South Bend, Ind. This device is built for long service and is sold with the guarantee to run continuously for 365 days a year without labor or attention, except for an occasional cleaning, about three times during the year.

The maker declares that this still will purify water regardless of its source or condition, and it should prove a profitable investment when it is considered that only distilled water can be used in storage batteries. This liquid usually retails at 15 to 25 cents per gallon.

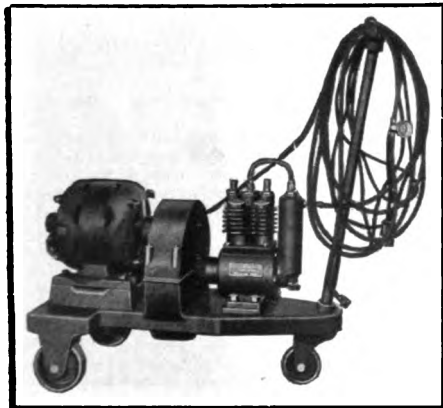
The first cost of the apparatus is practically the only expense, as about one to two cents worth of gas will generate enough heat to produce one gallon of distilled water. If gas is not accessible, gasoline or kerosene burners can be fitted at an additional charge of \$5.

The Peerless water still is made in three models, ranging in capacity from two to 12 quarts of distilled water per hour, and in price from \$15 to \$40.

MASTER GARAGE PUMP.

Two New Models That Have Long Pistons Without Rings to Prevent Oil from Being Forced Into Tire.

The Hartford Machine Screw Company, 508 Capitol avenue, Hartford, Conn., has added two new models, W and Y, to its already extensive line of air pumps. The model W, illustrated herewith, is of the two-cylinder, motor driven type, and is designed for use in public garages where there is a demand for quick service. Air can be supplied directly to the tire from the pump, or connection can be made to a storage tank so that a supply will always be available.



Master Garage Pump, Model W.

A notable feature of all Master pumps is that in no case are piston rings used. The pistons are extra long and made of special steel, which is carefully hardened, tempered, ground to size and then lapped into the cylinder walls. The company states that this type of piston eliminates all danger of oil being forced into the inner tubes. As an added precaution against oil, however, a small expansion chamber is attached to each pump, which serves to clarify the air. The General Electric 1/2-horsepower motor is used for this model. The complete equipment can be obtained mounted on a truck or without.

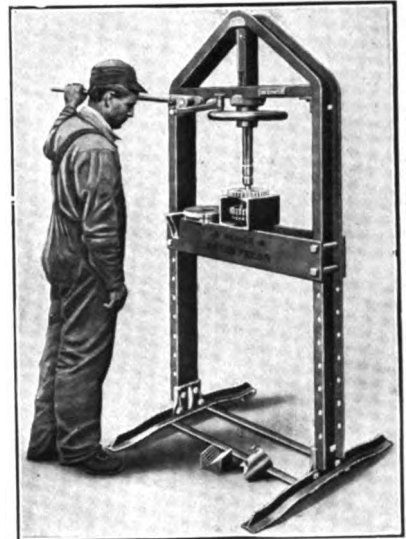
The model Y is a stationary belt driven pump and is designed for garages equipped with power unit and shafting. This type embodies all the high-grade qualities of the one described above and may also be used for inflating the tires direct or for filling a compressed air tank. Each pump is fully equipped and ready for operation. They are fully guaranteed for one year. Further details can be obtained upon request.

WEAVER 20-TON GARAGE PRESS.

Well Constructed Press Designed for All Types of Work by an Ingenious Lever Arrangement.

The Weaver Manufacturing Company, Springfield, Ill., is marketing the garage press shown herewith at the low retail price of \$48 complete. An advantage of this equip-

ment is the unlimited scope of work that the heavy pressure makes possible. This pressure is made available by an ingenious ratchet and lever mechanism operating in conjunction with a 30-inch handle. This affords a leverage of over 1500 to one. The frame is formed from a single piece of heavy five-inch channel steel, there being no joints or connections to weaken it. This construction has the advantage of great strength at a minimum weight, permitting the device to be easily moved to any place desired. The hand wheel is 15 inches in diameter and affords sufficient leverage for light work. The weight of this member, as well as that of the screw, is carried upon ball bearings, while the thrust is directed against heavy bronze bearings. A feature of interest is that the screw does not revolve, but retains a firm bearing upon the work to be forced. The screw is two inches in diameter and has a No. 3 pitch Acme thread. It has a range of movement of 12 inches. The bolster which holds the plate can be adjusted as desired, the extreme being 48 inches. A vise block attachment which is furnished with each press and which fits between the screw and bolster plate, provides a means for holding bulky and awkward pieces. An equipment of channel blocks is also furnished, to be used as blocking. Besides serving as an upright press, it can be turned in a horizontal position. Inquiries concerning this press will receive prompt attention when this journal is mentioned.



Weaver 20-Ton Garage Press.

INDUSTRIAL HAPPENINGS AND COMMENT.

THE Packard Motor Car Company, Detroit, is exerting every influence to obtain manufacturing material to meet the demands of increased production. In one day recently two Adams Express Company cars, hauled by a special locomotive, arrived at the Packard plant, one of them containing 25,000 pounds of steel from Reading, Penn.

Detroit Motor Car Companies have increased in productivity to such an extent that the Michigan Central railroad has been obliged to order 500 new freight cars for the transportation of automobiles, which brings the total for all lines entering Detroit up to 2000 devoted to the motor vehicle trade.

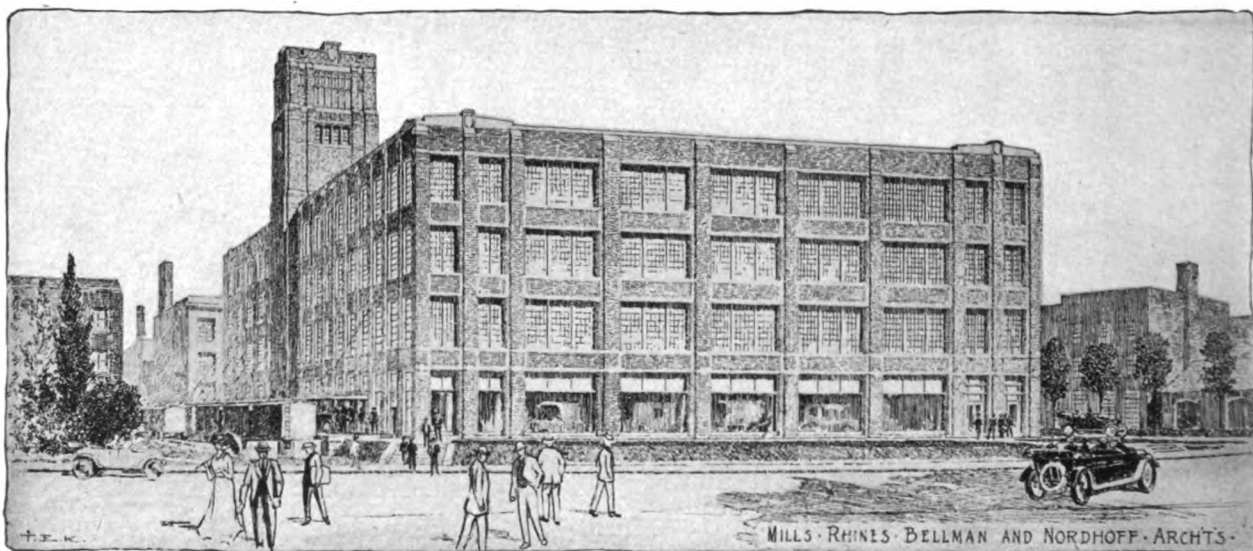
The Columbia Motor Truck and Trailer Company, Kalamazoo, Mich., has made it known that it is about to close a deal for five acres of land on which to build a new plant. During 1915 the company made about 75 cars, and is planning a production of from 300 to 400 machines for 1916.

The Atkebolaget Svenska Kullagerfabriken, a Swedish corporation engaged in Gottenburg in the manufacture of ball bearings, is to locate at Hartford, Conn. The new company, a \$2,000,000 corporation, will be known as the S. K. F. Ball Bearing Company, and at the beginning will employ about 300 men. Among the directors is M. W. Hanson, vice president of the Pratt & Whitney Manufacturing Company. Until the company

The Emil Grossman Manufacturing Company, Inc., New York City, has leased the top floor of the building formerly occupied by the Winton Motor Car Company at Michigan avenue and 13th street, Chicago. The western manufacturing and distributing branch will be located there and will have 6000 square feet. Rudolph Cony is manager.

The Timken-Detroit Axle Company is making four large additions to its plant, one of which is a completely equipped drop forge provided with Wicks upright boilers that generate 1200 horsepower. Exhaust steam from the plant will be used in turbine engines to generate electricity, and magnetic cranes running on overhead trolleys will transport forgings to and from 35 ponderous hammers. The new plant, 400 by 70 feet, one story high and of steel construction, and to cost about \$260,000, is to be connected with the main plant on the opposite side of the street by tunnels.

The Oakes Company, Indianapolis, has erected three large factory buildings, which increases the capacity of the company to 2000 fans a day. Despite the increase of space and equipment, however, the company has been obliged to run day and night shifts. The capitalization was recently increased by \$50,000. Warren and Will Oakes, brothers, are the head executives of the organization, which manufacture a starting crank lock provided with Yale lock and combined with license tag holder;



Willys-Overland Company Is to Build This Four-Story and Basement Building at St. Paul.

is in a position to supply American-made bearings, the S. K. F. will continue to import Swedish-made bearings and will continue as long as may seem advisable.

Mabey's Electric Manufacturing Company, Indianapolis, has purchased a plot of ground at 1020 Central avenue, that city, on which now stands a two-story building. About the first of the year this company will make extensive additions to its present plant. Among the company's products are an automobile cigar lighter, patching tool, glue pot, pop corn popper, water urn and a dry mounting iron and heater for developing pans for photographers.

The Maxwell Motor Company reports that its plants in Detroit, Dayton and Newcastle are being pushed to the utmost to break in September the production record established in August, during which more than 5100 of the 1916 models were shipped.

The Goodyear Tire and Rubber Company, Akron, is laying plans for another great stride forward during the coming year. The new factories, with five acres of floor space, will increase the tire capacity to 20,000 daily and will require the employment of 2000 more men.

the Oakes fan-horn-pump and a combination of tire pump, cooling fan and warning signal, and also does a large stamping business.

The Hydraulic Pressed Steel Company, Cleveland, paid a bonus of \$1400, at the rate of \$100 a day, to the contractor who erected its new 360 by 80 foot concrete, steel and glass building in 42 days, instead of the 56 days provided for in the contract. However, before the building was complete, the rush of orders had accumulated at such a rate that the company was compelled to have the new structure extended 200 feet further to provide room for manufacture. The building stands on a concrete foundation with walls but five feet high, so that practically the entire structure is steel and wire mesh glass.

The Willys-Overland Company is to erect at St. Paul a four-story and basement building, 461 by 188 feet, wherein will be maintained a combined service station, sales room and warehouse for the benefit of patrons in the northwest. When complete the building will have floor space of 435,000 square feet, which is equivalent to the area of four ordinary city blocks.

SUGGESTIONS FOR THE FORD CAR OWNER.

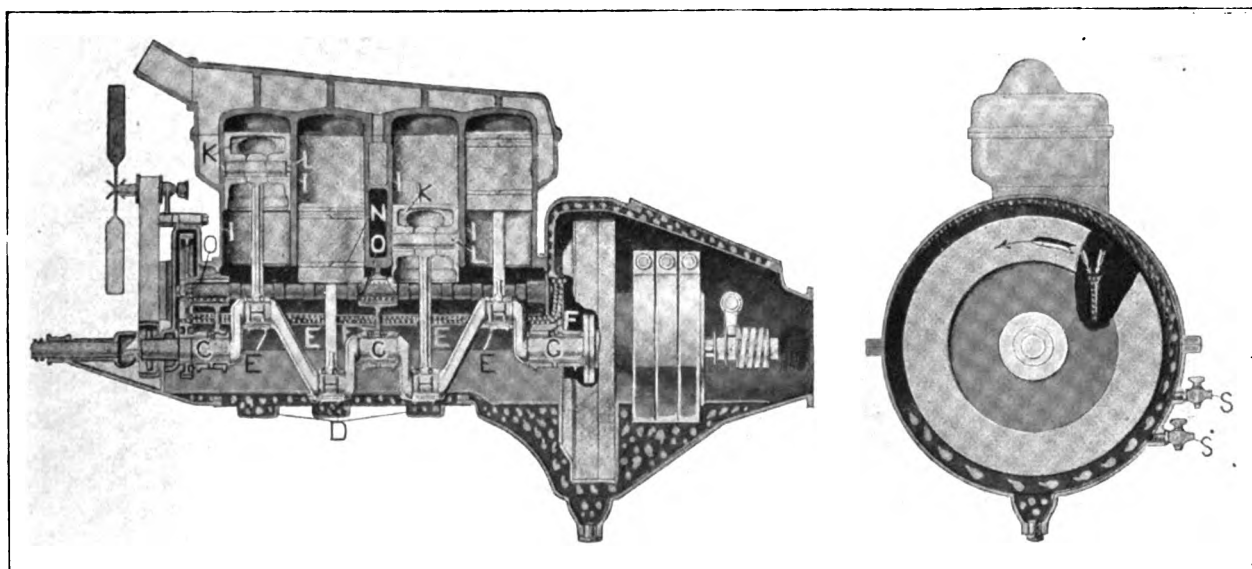
The Lubrication System of the Unit Power Plant and Its Characteristics When the Relation of the Different Components of the Assembly Are Correct.

The 32nd article dealing with the construction, operation, maintenance, care and repair of the model T Ford chassis is devoted to the consideration of the lubricating system for the engine and the attention that is necessary to insure an adequate lubrication and to avoid the result from excessive use of oil.

LUBRICATION was the subject of very careful investigation in the designing of Ford unit power plant, because while the main purpose was obtaining extreme manufacturing and operating simplicity, sufficient lubricity must at all times obtain. From the viewpoint of the engineer excessive lubrication of an internal combustion engine will not have destructive in-

babbitt metal bearings of the crankshaft and the big ends of the connecting rods, while far more serious consequences may happen, such as a piston seizing (sticking) in a cylinder, possibly buckling the crankshaft, bending or breaking a connecting rod, breaking a piston or even puncturing a hole in the crank case base.

When a bearing is not sufficiently lubricated and heats until the anti-friction composing the metal is softened or even flows from the cage or rod end retaining it, the condition is referred to as a "burned bearing." In other words, because of lack of oil the friction so heated the metal that



Sectional Views of Ford Unit Power Plant: At Left, Longitudinal Section; at Right, Transverse Section; Maximum Oil Levels Being Indicated and the Circulation of the Lubricant Shown by the Series of Light Dots.

fluences, although accumulations of oil in the cylinders will coat the spark plugs and impair, if not prevent, ignition, and unconsumed lubricant will collect upon the piston heads and cylinder walls and will, with dust and organic matter drawn through the carburetor or the air intake, become hardened by the heat and form what is generally known to motorists as carbon. Such a condition will lessen engine efficiency, but no actual damage will result.

But if the oil supplied is insufficient, damage will certainly result, the most probable effect being heating and scoring or even melting the

it became plastic and no longer supported the load upon it, taking a new shape and so enlarging that the shaft or rod had side or end play, which would cause noise of a peculiar and distinctly noticeable character. Obviously, the only remedy in such an event is replacement of the bearings—not a matter of serious cost for new parts, but decidedly expensive because of the labor, while the machine will be unserviceable until replacement is made.

What Makes for Adequate Lubrication.

Attention has been directed to the consequence of excessive and insufficient lubrication

because adequate lubricity is imperative, and this cannot be obtained unless decided care is taken, despite the simplification of the Ford system. In theory and in practise the best result can always be obtained with machinery by supplying the lubricant in small quantities and constantly, and having a sufficient supply which can be drawn upon for a considerable period of time. In motor vehicle practise the last mentioned requirement is very important, for frequent renewal would demand a character of care that would be objectionable to those who drive the machines. The purpose of the designer of the Ford engine was to have a system that would supply oil continuously and with replenishments that would depend largely upon the use made of it, but which could be operated for a considerable time or distance with one supply.

Simplicity and economy demanded that the construction of the system have the fewest parts that were practicable, and efficiency requires that the engine be fully lubricated, especially as there was probability that many of the vehicles would be driven by those who had little or no knowledge of mechanics and who might, because of ignorance, neglect conditions that would receive attention from those more experienced.

Accurate Illustration of System.

The accompanying illustration of a Ford engine, which is reproduced by the courtesy of the Platt & Washburn Refining Company, and was originally published in a copyrighted book dealing with engine lubrication and Veedol lubricants, shows a longitudinal section of the unit power plant. It is absolutely correct as to detail and proportions and is the best sectional view of this engine that has ever been prepared.

The reader has been informed that the engine block and head are cast separately, the cylinder block forming the upper portion of the crank case, while the lower half of the crank case is formed of pressed steel about 1/16-inch thickness that is extended back of the engine to form the bottom section of the flywheel and gearset case. In this pressed steel section is an opening that extends from a point just forward of the front wall of No. 1 cylinder to a point directly beneath the wall between the third and fourth cylinders. This opening is 13 5/8 inches length and 5 1/4 inches width, and it is surrounded by a raised edge or ring that is 3/8-inch height and 5/8-inch width.

Formation of the Oil Troughs.

This opening is closed by a pressed steel plate or cover 15 1/2 inches length and 6 7/8 inches width, that is bolted on with a gasket between it and the

section to obtain an oil-tight joint, the lap being practically 3/4 inch. The plate is slightly curved to conform to the general shape of the crank case, and in it are three transverse channels or pits that are 9/16-inch depth and are, when the cover is in place, directly under the caps of the connecting rods of the first three pistons of the engine. By examination of the illustration one will note the three oil pits in the plate and the raised edges about the opening, which can be seen at the points designated.

From a point just back of the rear portion of the ring about the opening the crank case is sharply belled or enlarged to form a housing for the flywheel, and directly under the flywheel there is a cone-shaped pocket. From this the crank case bottom rises to a point slightly above the level of the connecting rod caps as shown. From the ring rearward the bell housing of the flywheel forms the reservoir in which the oil is carried.

The Correct Level of the Lubricant.

At the right of the longitudinal section of the motor is a transverse section of the crank case at the flywheel, the flywheel is cut away at the upper right side. In both sections the highest level of oil that should be used is shown by a light line below which is a darker area in which is a number of white dots, but in the transverse section the series of white dots extends around the flywheel to a point that corresponds to about three-quarters of its circumference, these being close to the wall of the crank case and being graduated in size to represent a uniformly diminishing volume of oil.

In the transverse section, at the right side of the crank case and outside, are two small cocks. The levels at which these are shown represents the highest and the lowest that lubricant should be in the crank case, and while statement is made by the Ford Motor Company that the best results can be obtained with the oil at a level midway between the two cocks, no gauge or indicator has been supplied by which this level can be determined, and the owner can either guess or, to be certain of the quantity it contains, fill the crank case until the oil flows from the upper cock.

No Knowledge of the Oil Consumption.

Were there exact knowledge of the quantity required to fill the crank case between the two drain cocks, and half of this placed in the engine base, perhaps the condition that is advised by the maker would be reached, but there is no manner of determining the consumption of lubricant other than to learn if there is a flow from the lowest of the two. Apparently there is no more

certain means of insuring that the supply is adequate than by filling the crank case.

The reader understands that the crank case of the engine is not obstructed below the level of the main bearings from end to end, and that the flywheel edge as it revolves is approximately a half inch above the inclined bottom of the case behind it. The illustration shows the engine in such a position that the oil level is correct for the fullest degree of lubricity. The engine case will be filled to the level shown by about four quarts of oil, when the lubricant will be 15/16-inch deep in the troughs beneath the three forward connecting rods in the bottom cover plate, and will be slightly below the level of the cover plate. The exact height can be learned by close examination of the illustration. This reference will show that the ring that encircles the opening in the bottom of the lower crank case section, which is 3/8-inch high and 5/8-inch wide, is intended to retain oil within it and in the troughs as a pool into which the connecting rods will dip as they revolve. The troughs are 9/16-inch deep. This oil level serves admirably when the chassis is standing or moving, so that the level is as is illustrated, but when the machine is ascending or descending grades the flow of the lubricant in the pool must be either backward or forward, and in volume dependent upon the angle of the gradient.

How the Lubricant Is Circulated.

Assuming the machine is being driven on a level surface, the condition of the oil, if the crank case is filled with lubricant to the height of the upper drain cock, is practically as represented. Approximately a third of the diameter of the flywheel is submerged in the oil, the lower parts of the three contracting bands that encircle the revolving planetary gearsets and the peripheries of the high and low-speed ratio drums and the service brake drum are beneath the surface, and at every revolution of the crankshaft the caps of the three forward connecting rods strike the lubricant in the pool, while the cap of the rear connecting rod strikes the surface of the oil in the reservoir ahead of the flywheel.

As the engine turns, the sweep of the connecting rods into the oil creates a splash that throws the lubricant from the left to the right side of the crank case, and as the ends of the rods are swung through the space beneath the cylinders the greater part of the oil is thrown off by centrifugal force in the form of spray. This is the result anticipated in all splash lubricating systems. The revolution of the gearset in the oil does nothing more than plentifully lubricate the

pinions and gears, and the degree of lubrication is greatly in excess of the actual needs, but this is not a condition that can be criticised, for it is insurance against wear.

The Distribution of the Oil.

The flywheel, as it is revolved in the oil, carries upward with it considerable of the lubricant, which is thrown off against the right side of the crank case and top of the flywheel housing. In the illustration of the transverse section of the crank case the arrow indicates the direction in which the wheel turns, and the cutaway portion of the wheel shows a small funnel, which is attached to the side of the crank case. This funnel is directly in the line of the movement of the flywheel assembly. The legs of the 16 magneto magnets, which are clamped to the flywheel, serve as paddles in that they throw the oil upward in considerable quantity as they rise above the surface of the lubricant, and this in part flows into the funnel. The funnel is connected with a brass tube that leads along the side of the crank case and all the oil collected is carried forward to and drained over the gears of the timing gear-set at the front end of the engine.

(To Be Continued.)

ROAD BOND ISSUE FOR ILLINOIS.

Commercial bodies of Illinois are urging Governor Dunne to aid in securing a state bond issue of \$10,000,000 for the construction of 1000 miles of state roads. It is proposed to have one road bisecting the state on a north and south line and three roads crossing the state from east to west in such a way as to divide it into four equal portions, placing them to serve the centres of population as best as is consistent with this plan. The distribution of the roads has evidently been suggested with a view to securing the political support of every part of the state.

BELLIGERENTS BUY U. S. SPARK PLUGS.

Shipments of 100,000 Bethlehem Five-Point spark plugs from the United States to the war departments of three of the belligerent countries have been made during the past two weeks. The manufacturer points out that these plugs were selected after comparative tests for quality in which all American makers took part and that no price concession was made, the price demanded being 150 per cent. greater than that asked by other standard concerns.

FORD CAR ACCESSORIES AND EQUIPMENT.

SUPERIOR FORD REAR FENDER.

Constructed with the Latest Design Curve and to Withstand Constant Strain on Ford Commercial Cars.

A specially designed rear fender to be used on Ford commercial cars is being manufactured by the Superior Lamp Manufacturing Company, 136 West 52nd street, New York City. These fenders are made in pairs, with irons complete, ready to attach to any kind of delivery body that may be mounted on the Ford chassis.



In pointing out the necessity of these fenders, the manufacturer declares that the present rear Ford fenders are not practical where a delivery body is being used. The Superior fenders have the latest design curve, and are made of extra heavy steel metal, to withstand the constant strain

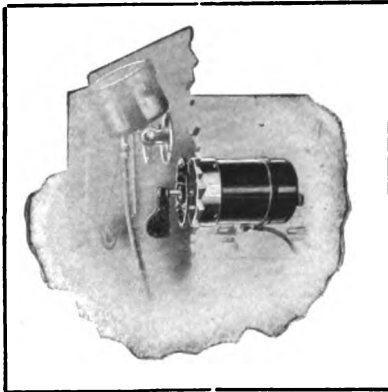
to which they are subjected.

They are finished in a triple coat of black hard baked enamel, and are furnished with an inside mud splash apron. They are carefully crated for shipment, and list at \$9.90 per pair. Special discounts will be quoted to the trade when mention is made of this magazine when writing.

CONNECTICUT MASTER VIBRATOR.

Master Vibrator for Ford Cars Which Has Advantage of Having Only Clamping Plate and Switch Lever Visible.

The Connecticut Telephone and Electric Company, Inc., Meriden, Conn., widely known as the manufacturer of Connecticut coils, is producing a master vibrator designed for Ford cars. This instrument insures a hot, accurately timed spark for each explosion, thus increasing the power and smooth operation of the motor. It can be used with dry cells or in conjunction with the Ford magneto.



Connecticut Master Vibrator.

A distinctive feature of the vibrator is that the instrument proper fits under the hood and the only part visible on the dash is the clamping plate and switch lever. The clamping plate serves as an indicator for the different positions of the switch lever. When the engine is stopped the lever can be removed, thus affording an effective means of

locking the car. Inquiries addressed to the Connecticut company will receive prompt attention when this publication is mentioned.

HOFFECKER SPEEDOMETER.

A High-Grade Special Model Speedometer That Sells at Popular Ford Equipment Price.

The highest grade speedometer for Ford cars, to sell at a price no higher than other popular equipment for

that make of automobile, is the opportunity now offered to jobbers and dealers. The speedometer is the Hoffecker and the manufacturer is the Hoffecker Company, Boston, Mass., a concern with a national reputation as the maker of superior speed indicators for the more expensive cars.

The company is now making a speedometer for Ford cars that is absolutely guaranteed to withstand the severest of service and to accurately register the distance travelled. The maker declares that the mechanism is so dependable that no adjustments are necessary during service.

Hoffecker construction uses no intermediate gearing or other delicate mechanism to transmit the front wheel revolutions to the instrument; the employment of a direct shaft drive insures long and reliable service. The figures are white against a black background, which facilitates reading and eliminates the danger due to drivers leaning forward to read dim figures.



Special Model Hoffecker Speedometer Offered at Popular Price.

The increasing rigor of speed regulations in the several states opens up an unlimited field for this type of speedometer, and its low retail price of \$12, coupled with superior workmanship, proves a big inducement to prospects. Inquirers should mention this magazine when writing to the company.

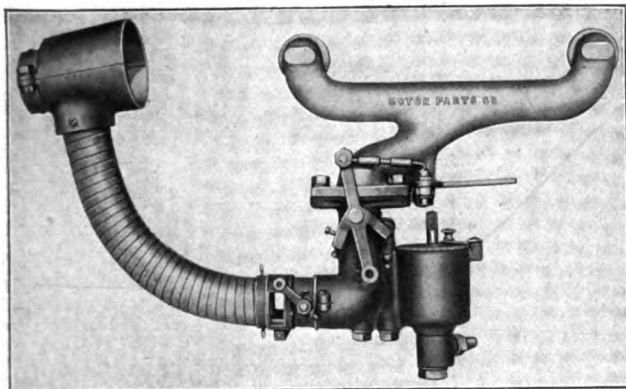
ZENITH CARBURETOR FOR FORD CARS.

A Special Type That Is Designed to Increase Power and Economy of Fuel.

The Motor Parts Company, Philadelphia, Penn., is selling Zenith carburetors that are adapted for Ford cars. This carburetor is listed as model 04 Zenith. It is equipped with a special manifold by which it can be attached to the Ford motor. For those who are not familiar with Zenith carburetors it will be well to state that it is a type constructed with what is known as a compound nozzle, that is, there are two supplies for the gas. The spray nozzle, which has a marked influence at high speed, is situated in the venturi tube, through which the air is carried with the gas to the cylinders.

The main feature of the carburetor, however, is that

It has a secondary gasoline well from which there is an opening just below the butterfly. When the butterfly is only partially opened the suction at this point is great



The Zenith Carburetor for Ford Cars.

and draws the well full of gas, whence it is carried into the cylinders, thus effectively priming the motor. This device effects a perfect mixture at very low throttle. The level in the float chamber is set before it leaves the factory and should not be touched.

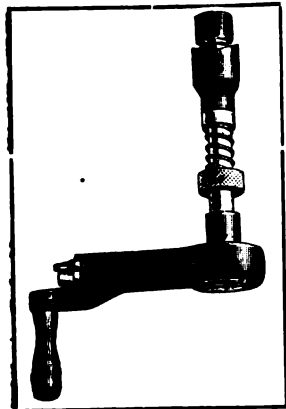
Simplicity has been the main factor in designing this carburetor, for there are no movable parts to get out of order. It is fool proof in that it has no visible parts that can be adjusted.

Claim is made that thin air will not effect the mixture in the least, as it is pointed out that Garros in a Bleriot monoplane equipped with a Zenith attained an altitude of 14,000 feet. As proof of its fuel economy it is stated that the annual economy contest held at Harrisburg, Nov. 26, 1914, was won for the third successive time by a car that was equipped with a Zenith carburetor. A special hot air drum and tube comes with the carburetor. The drum clamps around the exhaust pipe and insures an even temperature under all conditions. There is a slot in the tube which is adjustable to the operating conditions. Special gasoline and throttle connections are provided for its control. The carburetor and its fittings complete is sold for \$20.

COMBINED TIRE PUMP AND CRANK.

An Attachment Which Can Be Used Either as a Crank or as a Tire Pump Made for Fords and Other Cars.

The De Launty combined tire pump and starting crank is being manufactured by the Chicago Automatic Machine Company, Oakley avenue and Kinzie street, Chicago.



De Launty Combined Tire Pump and Starting Crank.

It replaces the starting crank supplied to turn over the engine. When it is in use as a pump a round, knurled nut is pushed inward, forcing a floating shaft running in phosphor bronze bearings, to engage the motor crank shaft by the clutch. The engine is started and the single-cylinder air pump, which is part of the apparatus, is operated. Twelve feet of rubber hose, pressure gauge and all necessary connections complete the equipment. It is made in two sizes, that suitable for Ford cars selling at \$10 and another size for larger cars at \$12.50. The outfit is fully guaranteed and will be sent on a 30-day trial to any part of the country.

WALDEN-WORCESTER WRENCHES.

Especially Designed Tools That Make for the Maximum of Service and Convenience.

The removal of a demountable rim from a wheel is made as near a pleasure as is possible by the use of the wrenches made for the purpose by the Walden Manufacturing Company, 60 Commercial street, Worcester, Mass., the builder of an extensive variety of such a u t o m o b i l e equipment.

DOUBLE SOCKET TEE HANDLE WRENCH

FOR DEMOUNTABLE RIMS AND SOLID TIRES

Stock No. D.S.T.12

Standard Sizes

5/8	1 1/8	1 3/4	2 1/4
1 1/8	1 3/4	2 1/4	3 1/4

Shank 6"

BRACE SOCKET WRENCH

FOR DEMOUNTABLE RIMS.

Stock No. D.G.B.

Standard Sizes

3-8
11-16
3-4
13-16
7-8

Two Exceptionally Meritorious Tools.

The double socket wrench affords either a 12-inch or a six-inch leverage. This wrench is also designed for use with solid tires. The sockets are provided in standard sizes. Tools equipped with sizes of from 5/8 to 3/4 of an inch retail at 65 cents each, while those with sockets of from one to 1 1/4 inches sell at 75 cents each.

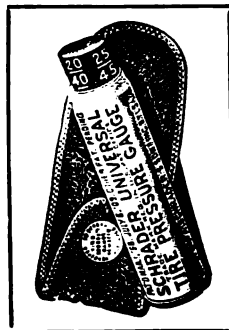
The brace socket wrench, designated by stock number D. G. B., renders extremely efficient service. It is an all-steel implement and makes the release of rim retaining bolts a simple matter. The standard sizes of the sockets ranges from 5/8 to 3/4 of an inch. The retail price is 65 cents. Special size braces will be made to order.

All Walden-Worcester sockets are machine turned and broached to size. They are attached to their shanks by a special process and are guaranteed not to twist or sheer off.

UNIVERSAL TIRE PRESSURE GAUGE.

Equipment Which Connects Hermetically with Tire Valve and Registers Exact Air Pressure.

It is imperative that pneumatic tires be inflated to the prescribed air pressure if long life and satisfaction are to be obtained. Over inflation is as injurious to the tire as is under inflation. To afford an easy and accurate means of ascertaining either condition, A. Schrader's Son, Inc., 783-791 Atlantic avenue, Brooklyn, N. Y., is manufacturing the Schrader universal tire pressure gauge, shown in the accompanying illustration. The pressure of the tire can be determined at any time by removing the valve cap and pressing one end of the gauge down on the stem. The exact amount of air in the tire is shown by the figures on the plunger. Absolutely no pressure is lost by applying the gauge, as it connects hermetically with the tire valve. It is enclosed in a leather case and retails at \$1.



Schrader Universal Tire Pressure Gauge.

THE GOVERNMENT NEWSPAPER.

The chief of the Bureau of Foreign and Domestic Commerce, E. E. Pratt, is calling the attention of sales managers throughout the country to the Commerce Reports, a publication of that bureau. The official truly says that Commerce Reports is a government publication which every American business man should read with his morning mail. It furnishes him with a daily summary of the market conditions and prices of different lines of industry in the world's markets, and contains notices of current changes in the tariffs and trade mark laws of foreign countries. It shows from day to day what competitors in foreign countries are doing.

It furnishes direct cable information from over 300 consular offices located in all parts of the world, and through its supplements, supplies complete annual reviews concerning the trade and industries of every country in the world. It also gives a list of foreign trade opportunities with which the sales manager can get in touch and which may mean specific and immediate business for him. It also gives a complete daily record of what the United States government wants to buy or construct.

The publication is delivered every morning by mail for one year for the nominal sum of \$2.50. Subscriptions should be sent to the superintendent of documents, Washington, D. C.

GERMAN WAR STOCKS GO UP.

Prices of stock of German companies making automobiles, guns, ammunition and war specialties have gone up in the last year even more than those of similar American concerns. A recent report on the subject shows the following advances:

	Recent July 25, Price.	1914.	Adv.
Daimler Motor shares	632	330	302
German Ammunition Factory.....	454	229	225
Schwartzkopf Machine	327½	239½	88
Rheinish Metal Works	281	92	189
United Cologne Rottlrell Powder.....	459	304	155
Loewe & Co., guns.....	404	278	126

GASOLINE HIGH IN NEW ENGLAND.

A recent comparison of the wholesale prices of gasoline in various parts of the United States made by a Boston newspaper showed the following results:

Boston .....	.15	Omaha .....	.09
Kansas City .....	.08	St. Louis .....	.095
Chicago .....	.085	Seattle .....	.095
Los Angeles .....	.085	Philadelphia .....	.105
Milwaukee .....	.085	Texas .....	.13

The reasons for the higher price in New York and New England, the territory covered by the Standard Oil Company of New York, are given as cost of transportation and the statement that the New England climate requires a grade of gasoline that is more expensive to produce than that which can be used successfully elsewhere.

JEFFERSON HIGHWAY IS PROJECTED.

Under the auspices of the New Orleans Association of Commerce, the Jefferson Highway Association is to be formed to promote the construction of an international road from Winnipeg, Canada, to New Orleans. The route has not been selected, but it is expected to go down the Mississippi valley on the west side of the river.

A meeting to organize the association will be held in New Orleans, Nov. 15 and 16. Invitations will be sent to 750 commercial organizations, mayors, governors, good roads associations, educational associations, civic bodies, public officials and governors. It is not probable that the November meeting will definitely select the route for the road. That will be left until later.

The committee of the New Orleans association of commerce, which has plans for the meeting in charge, is composed of P. M. Milner, chairman; Lucien E. Lyons, Jr., Ginder Abbott and W. P. Parkhouse.

COMING EVENTS.

September.

Sept. 27-Oct. 10—Show, Denver, Col.

October.

Oct. 1-2—Track meet, Trenton, N. J.
Oct. 2—Speedway races, New York City.
Oct. 2—100-mile race, Fresno, Cal.
Oct. 2-9—Show, Cincinnati, O.
Oct. 4-9—Show, St. Louis, Mo.
Oct. 4-6—Garage Owners' Convention, Columbus, O.
Oct. 6-16—Electrical show, New York.
Oct. 9—100-mile invitation race, Indianapolis, Ind.
Oct. 9—100-mile race, Mattoon, Ill.
Oct. 11-12—Convention National Paving Brick Manufacturers, Dayton, O.
Oct. 14—S. A. E. Standards Committee Meeting, Chicago.
Oct. 16—Speedway races, Chicago.
Oct. 16-22—Show, Montreal.
Oct. 16-23—Show, Pittsburg, Penn.
Oct. 17-18—Convention Electric Vehicle Association of America, Cleveland, O.
Oct. 18-24—Show, Troy, N. Y.

November.

Nov. 1-3—Show, Pasadena, Cal.
Nov. 20—Road race, Carona, Cal.

January.

Jan. 1-8—Show, New York City.
Jan. 22-29—Show, Chicago.
Jan. 24-29—Show, Buffalo.
Jan. 29-Feb. 5—Show, Minneapolis, Minn.

March.

March 4-11—Truck show, Boston, Mass.

PRACTICAL FACTS FOR NEW CAR OWNERS.

Elementary Instructions in the Economical Operation, Maintenance, Adjustment and Repair of the New Car—Answers to Inquiries.

IN THIS discussion of the elementary principles involved in the economical care, maintenance and operation of the new car, the type of car under consideration is that which employs sliding gears in the transmission. The planetary type is explained in the Ford department, in another part of the magazine.

In the sliding gear type, the manufacturers have, with few exceptions, adopted standard positions for the foot pedals. The clutch pedal is located on the left side and the service brake pedal on the right. These locations have been proven to be the most convenient and practical.

new car owner should be able to drive practically any sliding gear car made. The principle is shown in the accompanying illustration, which depicts the type installed on a popular and medium priced automobile.

In practise, the first speed used is that known as the low. To shift to that gear depress the left, or clutch, pedal and then release the emergency brake. Gripping the gear shifting lever lightly—not tightly—draw the lever back into the inner slot. Advance the throttle lever about an inch and then gradually release the clutch pedal.

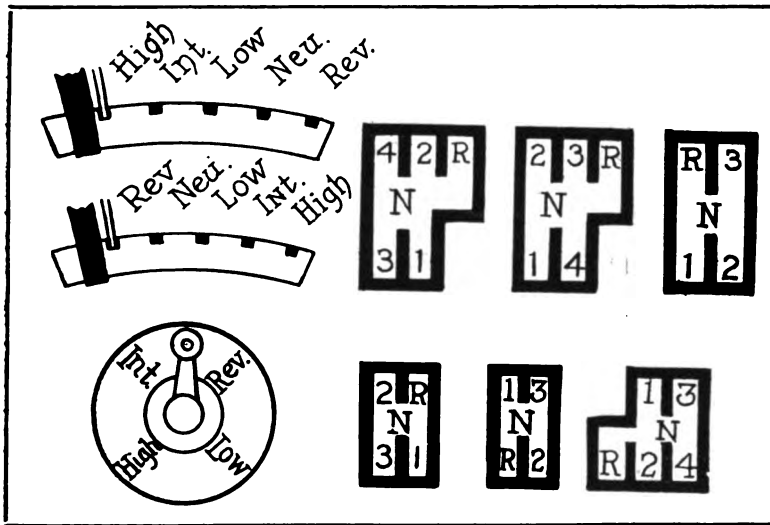
The low gear permits the motor to operate with comparative high speed, yet the speed of the car is low because of the great gear reduction. Care should be taken therefore not to race the motor—it is unnecessary and only tends to overheat the motor.

The next step is to retard the throttle lever and depress the clutch pedal, and immediately place the gear shifting lever back in neutral and then in the forward slot on the opposite side of the sector. Advance the throttle lever slightly and gradually release the clutch pedal. All these operations should be performed rapidly and in the order mentioned. If done slowly and with hesitation the car will lose momentum and the gears

come together with a clash without meshing. However, the clutch should be operated gradually and never with a jerky action, which may result in some part of the mechanism receiving undue strain and being sheared off.

The gears are now in second or intermediate speed, and the momentum of the car has increased. To shift into the third or high gear, feed more fuel to the engine by advancing the throttle slightly and then quickly depress the clutch pedal and draw the gear shifting lever in a direct line into the rear slot. Hold the clutch pedal firmly until the change has been made and then let it come back gradually.

To obtain the maximum of service from the motor advance the spark up to the point where



Variation of Speed Selectors Used on American Cars.

The new operator will soon find that his, or her, foot will locate these pedals almost by instinct after a few weeks of actual experience.

There are two types of gear shifts on the sliding gear car. They are commonly designated as "progressive" and as "selective." In the first named, the gears build to a higher or lower ratio as the gear shifting lever is moved in a direct line, backward or forward. In the selective type of transmission several kinds of selectors are employed. While the method of gear shifting varies on the different makes of automobiles, the principle embodied is the same in all cases. When this principle is once thoroughly understood, which can be done in a few minutes of study, the

DIXIE 20TH CENTURY MAGNETO

Leaders Use
DIXIE
20th Century Magnetos
4-cyl.—6-cyl.—8-cyl.—12-cyl.
--Others Use Just Ignition.

SPLITDORF
Electrical Co.
NEWARK, N. J.

(All SPLITDORF features are fully covered by patent or patents pending)



Write for full particulars



Why Freeze Yourself ?
Ruin Your Auto ?
The Superior
Safe Garage Heater

SAFE. NO FUMES.
NO GASES

Equipped with pilot light. No matches, no danger, no discomfort. An ideal positive heater.

SUPERIOR MANUFACTURING CO. N. S. Pittsburgh, Pa.

F. SHIRLEY BOYD
175 Massachusetts Ave., Boston, Mass.
R. I. V. Ball Bearings.
Baldwin Chains and Sprockets. J. H. Sager Line.

AUTOMOBILE
ELECTRIC LIGHTING SPECIALTIES
For the Automobile Owner and Manufacturer who wants SERVICE for his money
ELECTRIC LIGHTING SPECIALTIES Made to Order
CULVER-STEARN'S MFG. CO.
Worcester, Mass. Detroit, Mich.

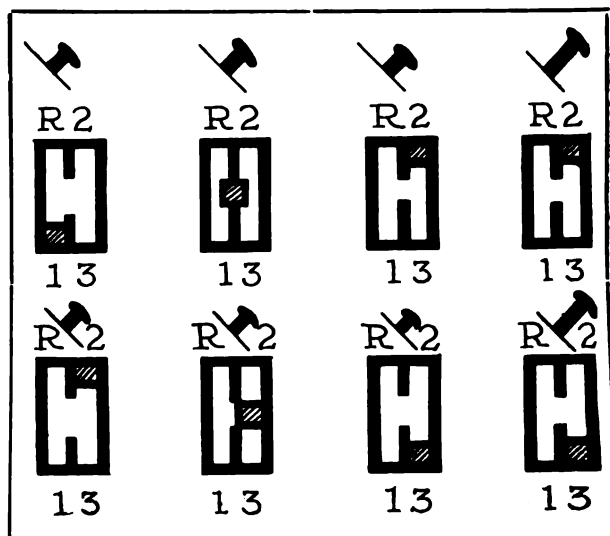
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the engine begins to "pound", and then retard it slightly until the pound disappears.

The throttle is the governor of the speed. While the transmission may be in high gear, the speed of the car can be reduced or increased by retarding or advancing the throttle lever to decrease or increase the supply of fuel to the motor.

The change to high gear usually is not effected by a gear, but by slots or keys milled in the front side of the front sliding gear. These slots or keys engage with a corresponding arrangement on the main shaft gear, which gives a direct drive from the engine.

The choice of speeds to suit the varying conditions of the road comes with practise. However, there are some arbitrary rules that the new



Movement of Clutch Pedal and Gear Shifting Lever When Changing from First to Second Speed and from Second to High.

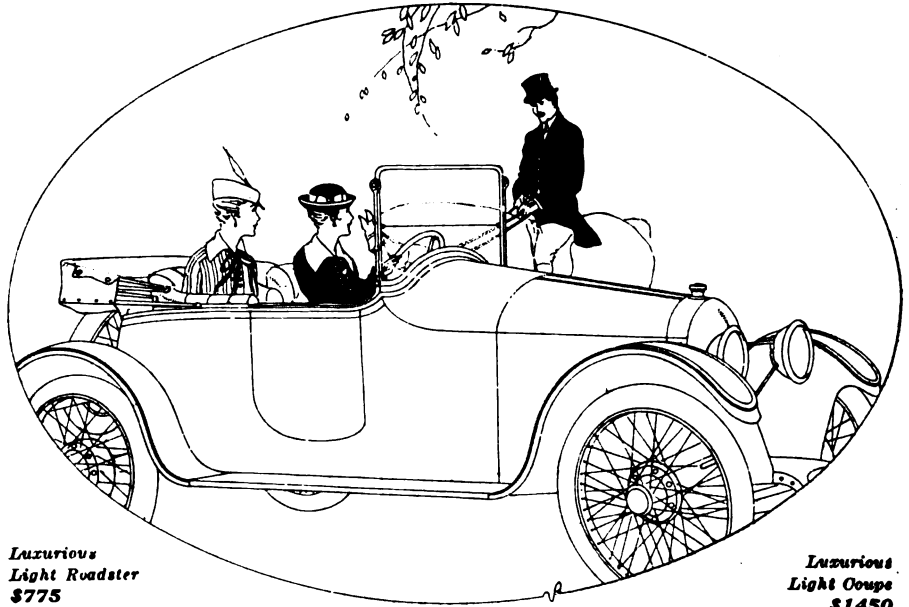
car operator must fix in his mind. Heavy roads (muddy or sandy roads) and steep grades tend to retard the speed of the car and frequently cause the engine to labor. At that time the gears should be shifted to the next lowest gear. When doing this, do it with precision and never hesitate in the midst of the operation. It is better for the novice to rehearse the operation mentally and then when sure that he understands the procedure to make the change quickly. If the gears do clash on a modern car, however, there is likely to be no material damage to the gears themselves—because they are usually constructed to withstand a high crush pressure—but the bearings are subjected to strains and the noise is objectionable and proclaims the amateur.

Many models have four speeds forward and

Contrast

THE high-strung saddle horse or the light Brewster runabout of the old days finds its counterpart today in the light luxurious Scripps-Booth.

As the former were found in those families of station to whom the best appeals and were used to supplement the luxurious Victoria or Landauet and pair, in similar manner the Scripps-Booth today for the same type of social environment performs its usefulness subsidiary to the limousine or touring car.



*Luxurious
Light Roadster
\$775*

*Luxurious
Light Coupe
\$1450*

Owners of the highest priced big cars are most enthusiastic about the new luxury of this light motor vehicle and are the majority of Scripps-Booth owners. By noticing the type of buyer

whom you see driving Scripps-Booth cars you will be best convinced of the quality and value of the car. Our dealers are for your assistance, and will appreciate the opportunity of a demonstration.

Scripps-Booth Company

Detroit, Mich



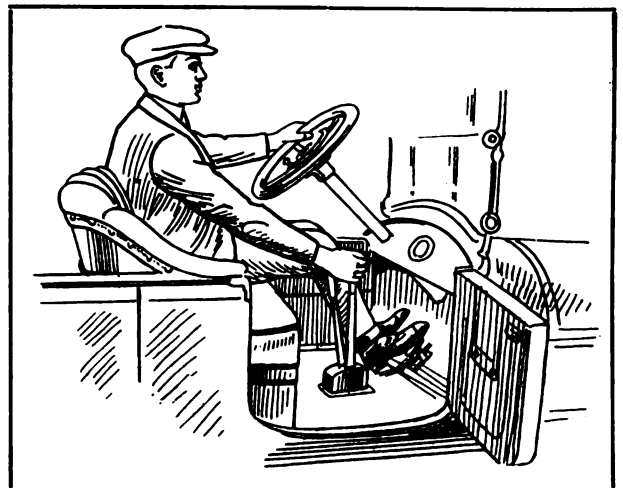
one reverse. Some have the direct drive on the third speed, while others use the fourth. When the drive is direct from the third speed, the fourth is usually provided for operation on very level highways. It affords a higher ratio of gears and permits the car to run faster than the engine.

The use of the gear shifting lever is a practise that admits of many "tricks of the trade." These can be learned only by experience. A popular "trick" is to determine before the gears contact whether or not the change can be made noiselessly. Some drivers become almost canny in this attribute. Another practise, which comes only with experience, is to place the gear shifting lever in neutral and allow it to remain there for quite a length of time before placing it in the desired slot. To do this the operator must know to a certainty that his car is running at the exact speed necessary to make a silent change. The expert while coasting down a hill can place the lever in neutral and at the base of the decline replace it without disengaging the clutch. This requires that the engine and car are operating at exactly corresponding speeds.

When driving on a steep grade or through sand the motor may produce a sharp metallic knock, yet seem to have power enough to "pull

(When Writing to Advertisers, Please Mention The Automobile Journal.)

through." This is the result of the spark occurring in the cylinder before the piston has passed top centre. If the spark lever is slowly retarded the knock will disappear. In case it does not,



Illustrating an Emergency Stop—Both Foot Pedals Fully Depressed and the Hand Brake Securely Set.

change to a lower gear.

Steering is simply a matter of practise, the driver becoming more efficient as he gains confidence. Bear in mind when driving on a straight

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Some of your customers may not know this, so drop the hint, and in most cases they will thank you for the information.

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HARRIS SUPERHEATED STEAM
OIL FOR STEAM DRIVEN CARS

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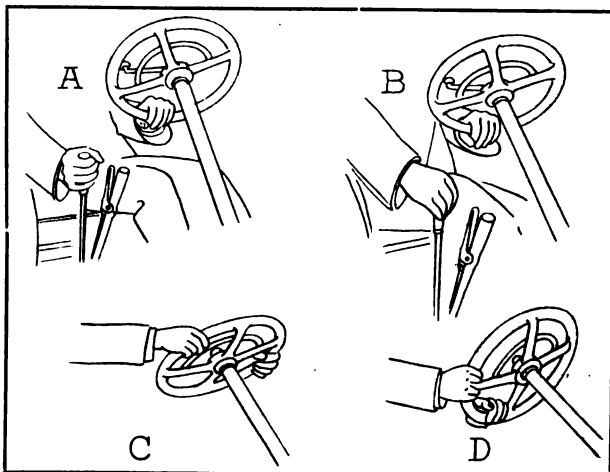
326 S. Water St., Providence, R. I.
 Branch: 143 No. Wabash Ave., Chicago, Ill.



"A Little Goes a Long Way and Every Drop Counts."

course that the rear of the car is clear of all obstacles if the front of the car can pass safely by. When crossing raised car tracks and deep gutters, drive slowly and cross them diagonally. This causes each spring to receive its shock separately and at a different time. The impulses tend to neutralize each other and result in smooth driving.

Under ordinary circumstances, skidding will only occur when driving over slippery pavements, or when turning corners at a sharp angle and at a high rate of speed. It can well be described as a period when the motorist has absolutely no control of the car. The best remedy is to try and neutralize the skid by turning the front wheels in the same direction that the rear of the car is sliding. Under no circumstances should the brakes be applied, except in an attempt to avoid a collision. Skidding can be prevented by rounding corners in as wide a circle



A, Wrong Method of Gripping Gear Shifting Lever; B, Proper Method; C, Tiresome Method of Steering; D, Comfortable Method.

as possible. This precaution will save tire expense, if nothing else.

Too much attention cannot be given to stopping the car. The requirements are that the operator should be able to bring the car to a gradual stop under ordinary circumstances, yet be prepared for a quick stop in an emergency. The effect of poor braking on the automobile can be better realized if one will for a moment consider the electric street car. One often hears the car running along the rails and producing a pounding sound at every few yards. This is caused by a flat wheel, which in turn is the result of applying the brake too quickly. This is the result of two hard metals contacting. Consider the effect when a soft rubber tire is scraped along a gritty road.

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Under ordinary conditions the driver should judge the distance at which he intends to stop the car and then gradually retard the throttle lever. This causes the car to slow down accordingly, the engine serving as a brake. The clutch pedal can then be depressed and the service brake gradually applied. Emergencies, however, require a quick stop, and, as the name indicates, the emergency brake is for this purpose. The stop can be made more effective by also applying the service brake. Do not stop abruptly, however, except in cases of absolute necessity, else the car will receive injurious strain throughout.

The reverse speed is obtained in the same manner as any other speed, except that it is imperative that the car be brought to a full stop before attempting to engage the gear. Frequently the reverse area is limited and skillful maneuvering is required. Bear in mind that the steering of a car moving in a reverse direction is diametrically opposite to that when running in a forward direction.

When the car has been brought to a standstill and it is desired to stop the motor, turn the ignition switch to the off position and while the motor is still operating on its own momentum, fully advance the throttle lever. This allows rich gas to be taken into the cylinders and greatly aids starting.

READERS' QUERIES.

Standard Gauge of Wheels, Operating Truck with Broken Drive Chain, Computing Horsepower, Fitting Key to the Timing Gear.

Wheel Gauge—H. K. G., Newton, Mass.

What is the standard gauge for automobile wheels in this country? What part of a motor vehicle is referred to by "chassis?"

The standard automobile wheel tread, or gauge, in this country is 56 inches. However, there is the Southern tread, or gauge, 60 inches, which is now being discouraged in favor of the 56-inch tread. One explanation given for the Southern gauge is that in early days horse-drawn vehicles, which were built with a 60-inch tread, wore ruts in the roadways of the rural sections and made travel by a 56-inch tread automobile extremely difficult, if not dangerous.

"Chassis," adopted from the French language, means in its accurate definition the frame of the car. In the motoring realm in this country,

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ACCESSORY & GARAGE JOURNAL

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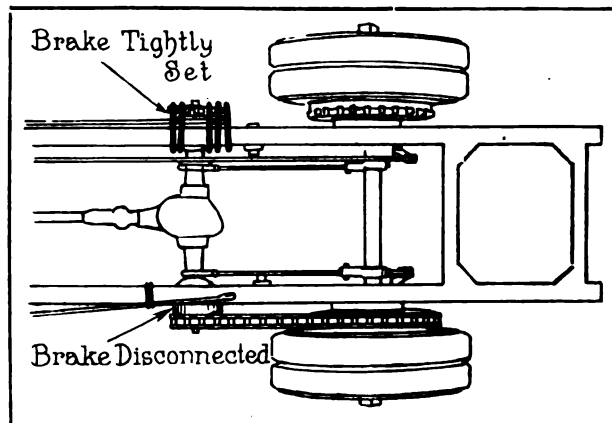
however, it is now meant to indicate all parts of the machine excepting the body, and includes engine, gear, springs, wheels, etc.

Operating Truck with Broken Drive Chain—H. L. G., Waupun, Wis.

Being a regular subscriber to your journal, I would like to take advantage of the correspondence department. I would like to know if there is any possible way to operate a truck after one of the driving chains have broken and there is no immediate means of fixing it.

If the truck is fully loaded, or the route hilly, it is doubtful if there is any satisfactory means of operating the vehicle on its own power without replacing the chain. If the conditions are propitious, the truck can usually be propelled by one chain.

By jacking one wheel of any automobile and placing a gear in mesh, it will be seen that the car does not move forward, but only one wheel spins. This is the wheel offering the least re-



How to Operate a Truck When Drive Chain Is Broken.

sistance. The same principle applies to truck wheels, of course. The driven wheel must be arranged to offer the least resistance. This is easily accomplished by releasing the brake band on the driving side and then tightly setting the brake on the opposite side. The sprocket should also be roped to the chassis, as shown in the accompanying illustration. Of course it will be necessary to use the emergency brakes fitted to the rear wheels for all purposes. It is obvious that the strain on the tied sprocket is tremendous, and the suggestion offered above may be difficult, if not impossible, on heavy trucks.

Computing Horsepower—H. R., Homewood, Kan.

Can you give any good reason why automobile manufacturers invariably overrate the horsepower of their cars in their specifications about 50 per cent. according to the A. L. A. M. standard ($\frac{D^3}{2.5}$)? How fast are the present engines supposed to run?

The A. L. A. M. horsepower formula (now adopted by the Society of Automobile Engineers), was originally used by the Royal Automobile Club of Great Britain to approximate power production. It is assumed to represent capacity with a piston speed of 1000 feet a minute. At best it is a makeshift, and does not by any means fairly rate an engine.

Many factors govern engine capacity, among them being length of stroke, speed, compression, lubrication, ignition, carburetion and quality of fuel. Much can be accomplished by design alone. The manufacturer obtains his rating from brake tests, made when the engines are operating to highest efficiency. The result is the actual capacity, but obviously these figures may be considerably reduced by lessened efficiency.

The longer stroke motor will generally produce more power and at slower speeds than the short stroke engine, and yet the long stroke engine can be driven to very high speeds. The long stroke engine will have more complete combustion of fuel as a rule than the short stroke engine.

An example of the uncertain power of the long stroke was a Peugeot car with a single cylinder, 100 by 260 millimeters (about $4\frac{1}{8}$ inches bore and $10\frac{1}{2}$ inches stroke), which was rated by the R. A. C. formula at six horsepower. This machine was driven for six hours on the Brooklands, England, track and averaged 72 miles an hour for six hours, and the engine developed 38 horsepower. The engine speed closely approximated 3000 revolutions during this trial.

With such engines as are built today 1500 revolutions is regarded as moderate speed, and when driven to capacity from 1750 to 2500 revolutions is not unusual. The assumed 1000 feet of piston travel of the S. A. E. formula is generally exceeded by machines that have what are known as high-speed engines. As no engine will develop its fullest capacity unless in the best of condition and all functions are perfect from an engineering viewpoint, the S. A. E. formula can be accepted as representing average or normal power production.

High Tension Distributor or Timer—T. K. G., Philadelphia.

I am somewhat uncertain of the definition the terms "high-tension distributor" and "timer." I would like to know if these both denote the same part or are separate units.

High-tension distributors and timers are entirely separate units. The timer is used in conjunction with a low-tension current and merely serves to interrupt the primary current at regular

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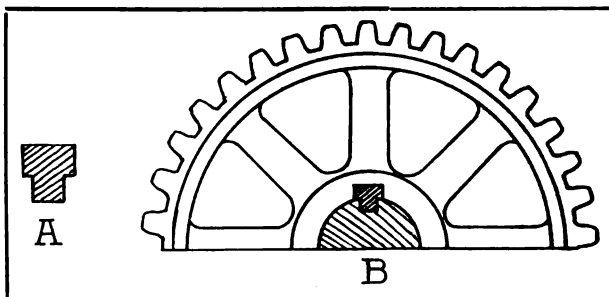
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intervals. With this device it is necessary to use a transforming coil, as the current supplied by the battery is not of sufficiently high potential to jump the air gap at the spark plug. The high-tension distributor is used to distribute a current of high voltage to the several plugs at the proper intervals. While the purpose of the two is comparatively the same, that is, to deliver the current to the cylinders in the proper firing order, yet the two are used on entirely different systems.

Fitting a Key—W. P. J., Milford, Mass.

I have a two-cylinder pleasure car on which is a loose timing gear. The gear is driven by a Woodruff key. I find that the shaft is in perfect condition, but the slot in the gear is worn. Now would it be advisable to cut a larger groove in the gear and shaft and use a thicker key, or would it be better to purchase a new gear? As the shaft is in good condition, I do not like to cut a larger groove.

If the teeth of the timing gear are in good condition, it is not necessary to purchase a new gear. The cutting of a larger slot in the shaft would not weaken it in any manner, and if the



A Illustrates How Key Should Be Fitted to Fit Slot of Timing Gear; B Shows How It Should Be Inserted.

operation be correctly done, it is doubtful if it would again be necessary to disturb the parts. However, should you not care to enlarge the slot in the shaft, there is another method frequently used with good results. Enlarge the slot in the gear until all ragged edges are eliminated. Measure the depth of the slot in the shaft and mark the distance on both sides of a key that snugly fits the slot. Place the key in a vise and file off an equal amount of stock on both sides until the part marked off corresponds in width to the groove in the shaft, as at A. When assembled, the result will be as shown at B.

Brake Does Not Grip—J. P. M., Putnam, Conn.

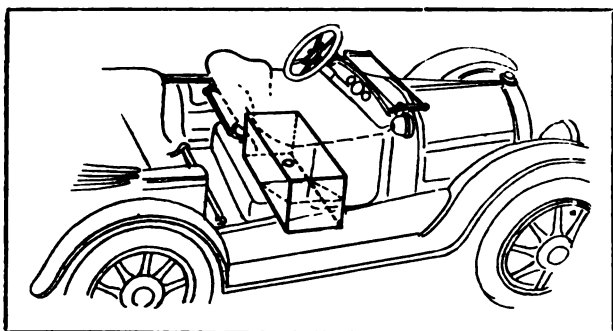
I have recently had the foot brake bands relined and adjusted. At times the brake holds well, but at other times it has no effect on the wheels when applied. The adjustment is good, as the pressure is gradually applied to both wheels at the same time. How can I remedy this trouble?

The condition stated in your letter is dangerous and should be promptly remedied. Are you

positive that grease or oil has not worked onto the lining? Gasoline or kerosene will remove this. Frequently grease will work out through the axle housing when the differential housing contains too much lubricant. If on inspection, you find that the lining is dry, it is advisable to use a good belt dressing, such as is frequently used to prevent belts from slipping. Also tighten the rod leading to the foot pedal so that the full pressure is applied to the brake when the pedal is about three quarters depressed. This allows unusual pressure to be applied to the pedal in an emergency.

A Tilted Gasoline Tank—B. N. C., Chattanooga, Tenn.

One morning when I tried to start the motor of my six-cylinder car, which stood in the gutter before my home, it ran for about a minute and then stopped with a loud explosion. I thought possibly the gasoline supply had been exhausted, but when I measured it there was three inches left. Continuous cranking failed to start the motor again. A friend towed the car up the street a short distance, and the motor began to run in normal condition—and continued to run. What is the answer?



Phantom View of the Gasoline Tank, Showing How Fluid Settles in One Corner When Car Rests on Incline.

While it is possible that there may have been mechanical troubles, it is, nevertheless, more probable that the position in which your car stood caused the trouble. If, as is usual, the road before your home is crowned, your car was tilted toward the curb—and, of course, the gasoline tank was in the same tilted position. You probably measured the tank nearest the curbing, which, under the circumstances, would contain the larger part of the small supply left in it, while the other end would be dry. There probably was enough gasoline left in the supply pipe to start the motor, but not enough to keep it running. The reason operation was resumed when the car was towed to another position was that it then stood on a level, which permitted such gasoline as remained in the tank to flow to the carburetor. To fully understand this explanation, examine the illustration herewith. This is a common experience and one that puzzles many motorists, until the cause is explained.

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(When Writing to Advertisers, Please Mention The Automobile Journal.)

The Use of Three Piston Rings—B. V. D., Astoria, N. Y.

Can you inform me why two and three rings, and many times four, are used on the piston? If each ring is claimed to be absolutely compression tight, I do not understand why more than one is necessary.

It will be noted by referring to A in the accompanying illustration that there is a $\frac{1}{4}$ -inch opening in the ring. This opening is an absolute necessity, as the ring must be spread to reach its place on the piston. If this opening could be fully closed, so that it would be absolutely compression tight in the cylinder, there would be no real need for more than one ring. This is not the case, however, as a little of the compressed gas escapes through the slot as shown at B and must be checked by the next lower ring. Should any escape through the slot of this ring, it will be checked by the ring lower down. Several rings, composed of two or more sections, are now on the market. As the slots are sealed by the overlapping sections, the rings are claimed to be compression proof. As a matter of precaution, however, and to afford a better bearing surface

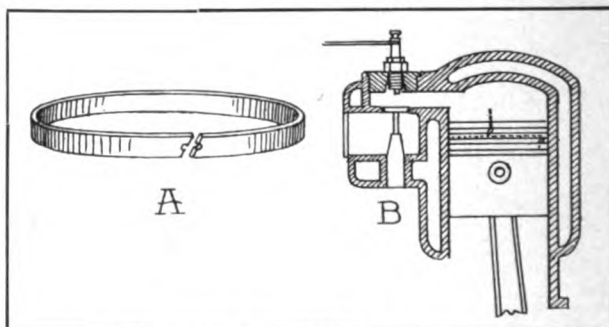


Diagram Illustrating Necessity for More Than One Piston Ring in Ordinary Practice.

for the piston, multiple rings are used.

Cylinders Quickly Carbonize—F. L. W., Charleston, S. C.

I am experiencing much trouble with a 1911 Ford delivery wagon in which the motor quickly carbonizes. I have used several kinds of oil and reduced the feed as low as possible, yet when I have run the machine for three or four days there are considerable deposits of carbon in the cylinders, which greatly reduces the power, as well as causing a very loud knock. The carburetor has been adjusted very closely, but without improvement. Can you suggest what may cause this condition?

Overheating may be the result of many conditions, such as impeded water circulation, retarded spark, loose fan belt, sticking valve, rich or lean mixture, weak magnets on the magneto, insufficient oil supply, grounded wires, tight bearings, etc. Your car has been in continuous service and overheating has recently developed. As you state that the carbon has been removed and the car was operated over all kinds of roads and no doubt in all kinds of weather, you may be experiencing a same trouble not infrequently

met with. Usually the radiator is covered on both sides with a net work, which is commonly termed honeycomb. During rainy weather, when the road surfaces are soft, mud will splash and be deposited in this net work. In time these accumulations will greatly lessen the effective cooling area of the radiator by obstructing the circulation of air. This will prevent the radiation of the heat in the water and consequently overheating must result. The remedy is to remove this dried accumulation with a piece of wire, and when this is done and the cooling system is again normal the engine ought to have its former efficiency.

Prevalence of Left Hand Drive—Constant Reader, New Haven, Conn.

Why do manufacturers stick to the left hand drive on the recent models of automobiles?

Traffic conditions have a great deal to do with the prevalence of the left hand drive in this

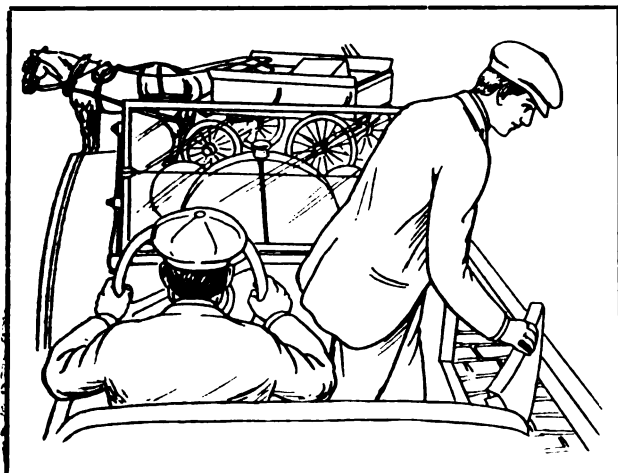


Illustration to Emphasize the Value of the Left Hand Drive in This Country.

country. Seated on that side of the driving compartment, it is much easier for the operator to watch approaching vehicles than from the right hand side when there is another vehicle immediately ahead of him. In Europe the traffic conditions are just the reverse, as is generally the location of the driver's seat, the flow of traffic bearing to the left instead of to the right, as in this country. The left hand drive also makes it much more convenient for the driver in alighting from the car, as is shown in the accompanying illustration. Instead of being compelled to step into the roadway, where he is in danger of being struck, he can step onto the sidewalk.

Back firing in a two-cycle engine is usually caused by a poor gasoline mixture.

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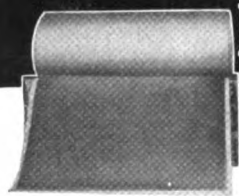
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Repair Fabric

Men who repair their own tires find the Goodyear Tire Accessories tremendously efficient. For example, Goodyear Repair Fabric is heavy Egyptian fabric, impregnated with fine quality friction.

Four features have made it the largest selling fabric in the world. It is made of long-fibre cotton, giving utmost strength and durability. It passes rigid inspection for flaws or defects. Only the highest grade friction is used—nearly pure gum. And then the fabric is calendered. Yet the price of this Goodyear Fabric, because of enormous production, is no higher than for fabric of lesser worth.

There are 22 Goodyear Tire Savers. We gladly send you a complete list with "Emergency Repair Book." Address desk 48.



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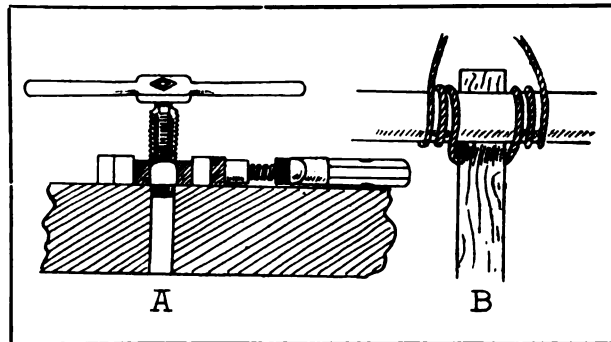
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SIMPLE WAY TO START A TAP.

Taps break when they are not properly started in the holes. Since nuts are made at the present time by automatic machinery, which produces accurate work, a simple method of starting a tap true is shown at Fig. A. Obtain a nut that fits the tap and run it up on the starting tap a little beyond the first thread. The nut can then be held stationary by a wrench and the tap will enter the hole in the accurate position.

SUBSTITUTE FOR PIPE WRENCH.

In the absence of a pipe wrench, a practical substitute can be devised by the use of a short length of rope and stout piece of wood. Double the rope and pass it three or four times around the pipe to be turned, as shown in Fig. B. Insert the piece of wood in the loop shown, and hold the ends of the ropes in one hand while ex-



A, Simple Guide for Starting Taps; B, Practical Substitute for Pipe Wrench.

erting pressure on the lever with the other. This device can be used advantageously on pipes with polished surfaces, which it is desired not to have marred.

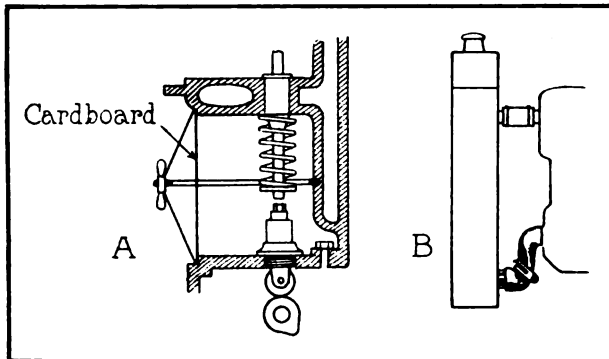
NIGHT AND DAY DRIVING.

It is often supposed, especially by the novice driver, that the car runs better and faster at night than it does in the daytime. While to some extent the damp air at nighttime may help carburetion, scientists have proven that the effect is imaginative. At night the speed and smooth riding is appreciated only by the sense of feel. In the daytime the sense of sight does not permit the mind to concentrate and does much to intensify the actual discomfort. Again at nighttime it must be admitted that the landscape seemingly whirls by the vehicle, the speed being anticipated by the time required to leave a stationary object and arrive at a definite point. To

prove the above statement, it has been shown by actual tests that a blind man in an automobile and on a smooth road, cannot determine whether he is travelling at 20 or 40 miles an hour if his face is protected so that he cannot feel the wind pressure against it. At night one cannot clearly see the objects at the side of the road and consequently the speed seems to be more than it actually is.

SILENCING NOISY VALVES.

On several modern cars, though the valves may be enclosed in metal cages, the noise produced by them is objectionable. Metal tends to carry the sound rather than to silence it. A simple remedy is shown in Fig. A. Cut a piece of cardboard to the shape of the side of the cover which faces the valves. The cardboard should be shellacked on both sides and then pressed firmly on the cover. Of course there must be a



A, How Cardboard Should Be Inserted to Silence Noise Valve; B, Showing Portion of Clamp to Straighten Water Pipe Kink.

small hole in the centre to admit the retaining bolt.

STRAIGHTENING A WATERPIPE KINK.

The rubber water pipes leading from the radiator to the cylinders frequently kink so badly at the point of bend that the water cannot flow by in a sufficient amount to provide an adequate cooling system. It is almost impossible to fully eliminate this kink but a simple temporary relief is shown at Fig. B. Fasten a metal clamp, such as is commonly used to retain the pipe to the radiator, on the pipe at the kink. This will provide adequate water passage.

Slow tire leaks may be the result of the displacement of the small rubber cushion in the bottom of a tire valve, which is apt to depress the core stem.

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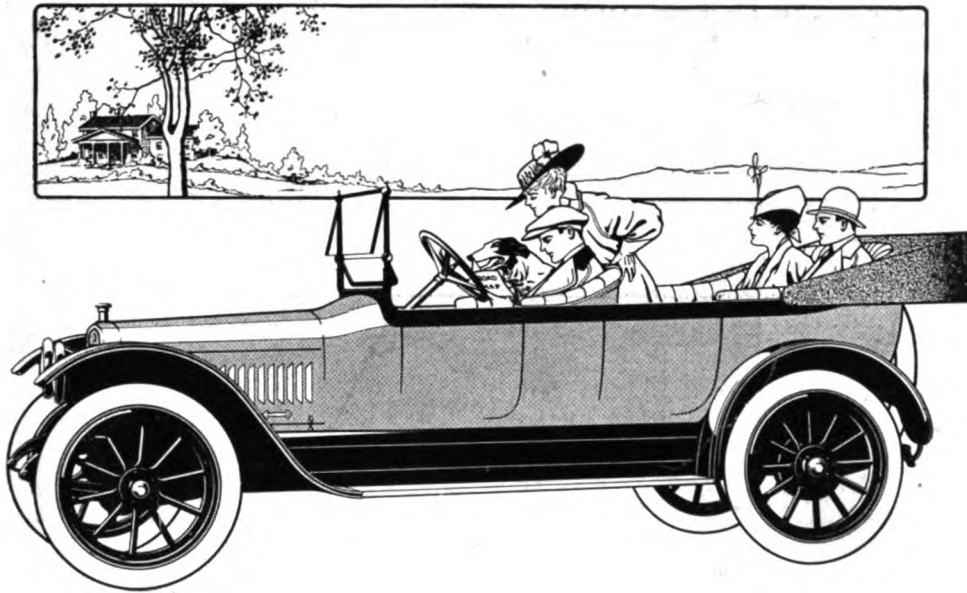
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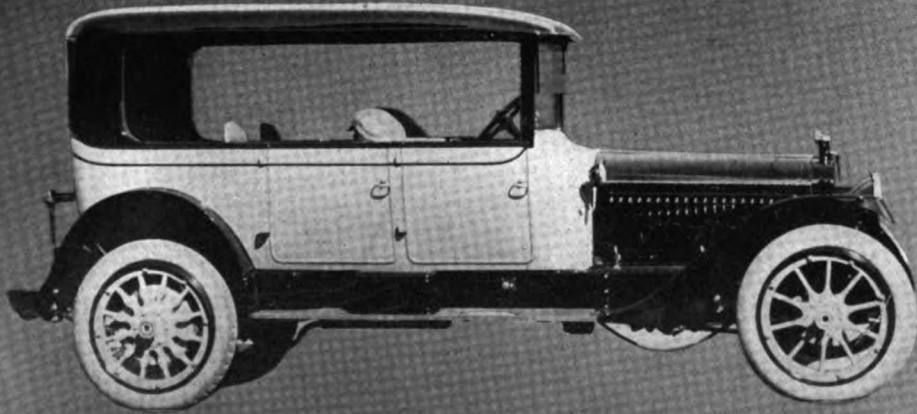
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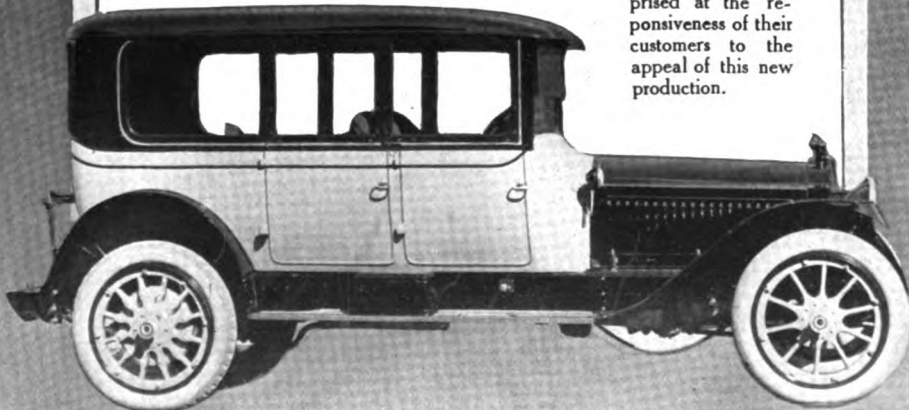
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Index to Advertisers.

	Page
Ahlberg Bearing Company.....	79
Barrett Manufacturing Co.....	69
Bosch Magneto Company.....	77
Boyd, F. Shirley.....	78
Coes Wrench Co.....	2
Culver-Stearns Mfg. Co.....	78
Dixon Crucible Co., Jos.....	73
Dover Stamping & Mfg. Co.....	72
Du Pont Fabrikoid Co.....	79
Eagle Oil and Supply Co.....	4
Eisemann Magneto Co.....	70
Goodyear Tire and Rubber Co.....	79
Harris Oil Co., A. W.....	73
Hartford Machine Screw Co.....	75
Hartford Suspension Co.....	77
Heinze Electric Co.....	76
Hotel Tuller	70
Inter-State Motor Co.....	76
Mansfield Mfg. Corp.....	75
Marburg Bros.....	75
McQuay-Norris Mfg. Co.....	Cover
Mea Magneto Co.....	75
Mecca Mfg. and Spec. Co.....	4
Metz Company.....	78
Milwaukee Auto Spec. Co.....	76
New Departure Mfg. Co.....	72
Nordyke & Marmon Co.....	77
N. Y. & N. J. Lubricant Co.....	72
Peerless Motor Car Co.....	75
Primm & Emmerson.....	4
Scripps-Booth Co., The.....	71
Splitdorf Electrical Co.....	73
Springfield Metal Body Co.....	3
Standard Oil Co., The.....	5
Staybestos Mfg. Co., The.....	74
Superior Mfg. Co., The.....	77
Texas Oil Company.....	70
Thermoid Rubber Co.....	76
Times Square Automobile Co.....	4
Tuller Hotel.....	70
Vacuum Oil Company.....	Cover
Valvoline Oil Company.....	70
Vanderpool Co., The.....	4
Weed Chain Tire Grip Co.....	73
Willys-Overland Co.....	10
Winton Company, The.....	1
Zenith Carburetor Co.....	Cover

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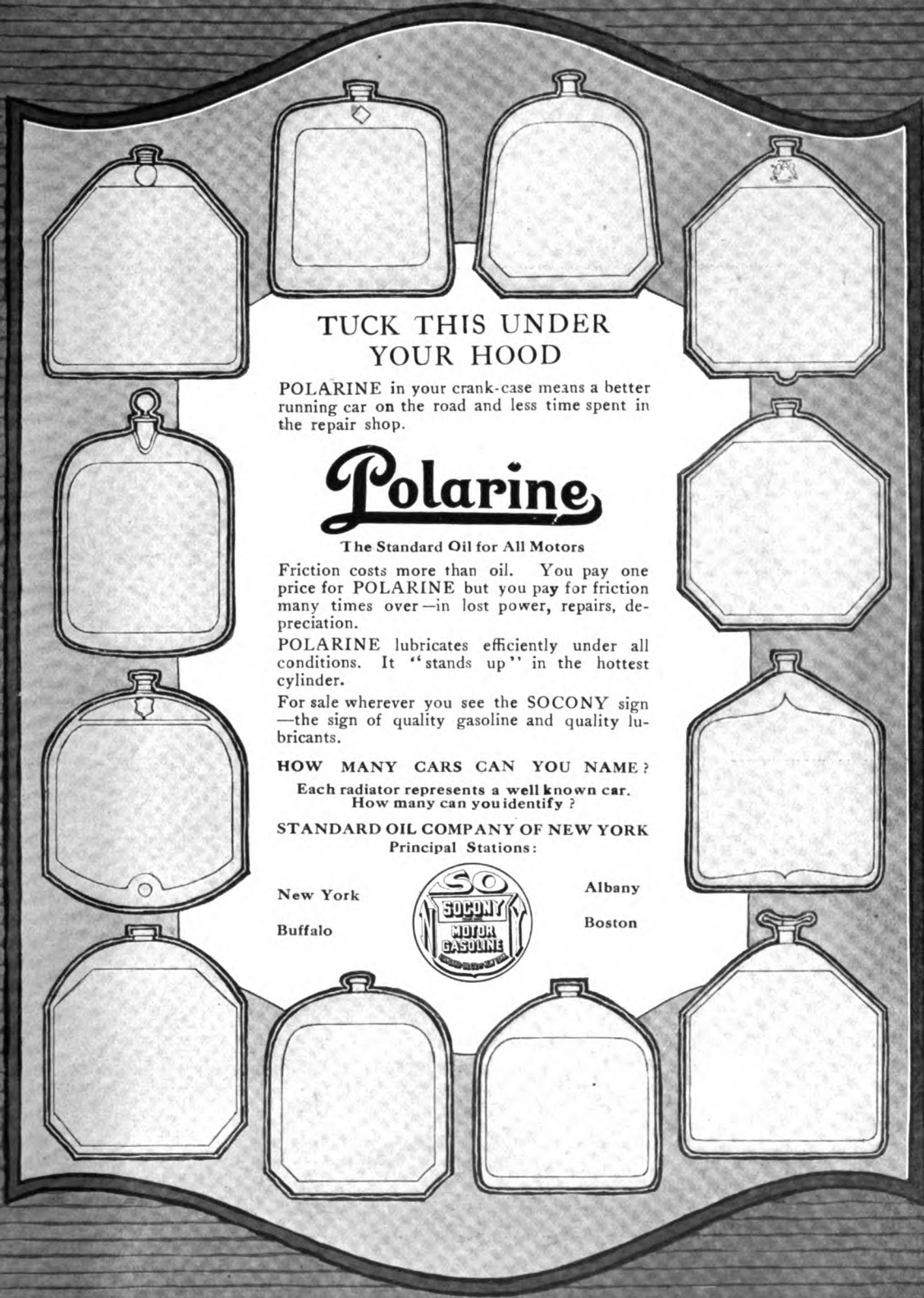
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VOL. XL.

OCTOBER 10, 1915.

NO. 5.

PUBLISHER'S AND READERS' PAGE.

FORD Car Owners will find in the department devoted to cars of that make some extremely interesting information specially prepared for their benefit in regard to maintenance, operation and repair. In this installment is included an unusual description of the lubrication system and the operating temperatures, which information is very valuable and has been developed as new data relating to the Ford car. This department also includes, as a regular feature, illustrations and editorial analyses of all that is new in accessories, equipment and supplies for the Ford car. The reader is urged to read these carefully and to write to the manufacturer or distributor the articles in which they are interested, always mentioning The Automobile Journal as the place wherein the description was seen.

An Instructive and Interesting Feature of the current issue of this magazine is the discussion of the 12-cylinder motor as used in the Packard Twin-Six by J. G. Vincent, which is to be found beginning on page 53. Since the announcement of these multi-cylinder motors early in the season, the motoring public has evinced a great interest in them. This article is a thoroughly understandable discussion stripped of most of its technicalities, but still accurate and interesting. Subscribers may expect to see more discussions along similar lines in future issues of The Automobile Journal.

The Correspondence Department is one of the most popular and appreciated in this magazine. Through it hundreds of readers have sought and obtained advice on many points in the mechanics of the motor vehicle that have puzzled them. It is the clearing house of practical information. The department is of particular value to the owner and operator who make their own repairs and often enables them to save considerable amounts that otherwise would have to be paid to the repairman. The inquiries are either answered through the columns of the magazine, in which case only initials are used, or by personal letter, as the inquirer

directs. Letters should be addressed to the Editor of Mechanics.

One of the Most Valuable Departments of any publication to its readers is its advertising section. This is particularly true of the magazines published by The Automobile Journal Publishing Company, whose advertisements are exclusively of interest to owners

of motor vehicles. They form a market place for the reader, informing him of a majority of desirable accessory, equipment, supplies and automobiles that are for sale. A glance will show the best products of the industry, their prices and from whom they can be obtained. By following these advertisements the reader can always keep informed as to the development of motoring and the influences that effect it.

There is Always a Demand for back numbers of any popular magazine, and consequently it is the practice of publishers to print extra issues against that demand. The policy of The Automobile Journal Publishing Company is no exception to that practice, but so many requests have been received that the supply of back issues is practically exhausted. Many of these requests come from persons who relate their inability to secure the back numbers on the news stands. It always has been the pleasure of the Publisher to fill these orders as far as possible. However, the better way to insure receipt of each number is to send in a subscription and the magazine will be mailed promptly on each publication day.

All Sections of the Country are bidding for the touring motorist. Excellent highways are being constructed and the various civic organizations are directing attention to the natural scenic splendors of their territories. In this connection the Touring Editor is prepared to continue his suggestions pertaining to any part of this country and Canada in answer to any inquiries sent to him. This is a good time to obtain information by which to plan tours for next year.

Partial Table of Contents.

	Page
*Stutz Stamina Triumphs.....	11
*Railroads Start Safety Campaign.....	19
*Motor Starting and Car Lighting.....	21
*A Special Convertible Sedan.....	27
*General News of the Industry.....	28
*Wider Fabrics Cheapen Tires.....	32
*Psychological Tests for Drivers.....	33
*The Solution of One Jitney Problem.....	34
*Practical Motor Car Repairs.....	38
*English Tariff on Motor Cars.....	41
*Car Accessories and Equipment.....	43
To Revolutionize Lubrication.....	45
*An Apperson Eight and Other Models.....	46
*New Series Saxon, Fours and Sixes.....	49
*The Theory of the Twin Six.....	53
*Industrial Happenings and Comment.....	58
*Suggestions for the Ford Car Owner.....	59
*Ford Car Accessories and Equipment.....	64
*Practical Facts for New Car Owners.....	68

*Indicates article is illustrated.

The best estimate of number of owners of motor vehicles in the United States is 2,360,000.

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Gemco Mfg. Co., 743 So. Pierce St., Milwaukee, Wis.

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Hill Pump Valve Co., Chicago, Ill.

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Rome-Turney Radiator Co., Rome, N. Y. (Helical Tube.)

RADIATOR CEMENT. (See Cements.)

RADIATOR & HOOD COMBINATIONS.
Superior Lamp Mfg. Co., 136 W. 52nd St., New York, N. Y.

REAMERS.

Harding Distributing Co., Boston. (Martell Aligning.)

REAR APRONS FOR FORDS.

Housel Sales Co., B Street, Buffalo, N. Y. (Gibmil.)

RINGS. (See Piston Rings.)**ROAD BUILDING MATERIALS.**

Barrett Manufacturing Co., New York. (Tarvia.)

ROLLER BEARINGS.

Hyatt Roller Bearing Co., Detroit. (Hyatt.)

Norma Co. of America, 1790 Broadway, New York City. (Norma.)

SEATS.

Auto Parts Co., Dept. T, 737-739 W. Jackson Blvd., Chicago, Ill. (Racing.)

SELF-STARTERS. (See Motor Starters.)

SHOCK ABSORBERS AND SUPPLEMENTARY SPRINGS.

Boyd, F. Shirley, 175 Massachusetts Ave., Boston. (Sager Peerless.)

Hartford Suspension Co., 147 Morgan St., Jersey City, N. J.

SPARK PLUGS AND IGNITERS.

Bosch Magneto Co., 223-225 W. 46th St., New York.

Faw, J. H., Inc., 41 Warren St., New York City. (Red Seal.)

Gibson-Hollister Mfg. Co., Boston, Mass.

Hartford Machine Screw Co., 512 Capitol Avenue, Hartford, Conn. (Master.)

Heinze Electric Co., Lowell, Mass.

Milwaukee Auto Specialty Co., 705-711 Chestnut St., Milwaukee, Wis. (Centerfire.)

Splittdorf Electrical Co., 98 Warren St., Newark, N. J.

SPEEDOMETERS.

Standard Thermometer Co., Boston, Mass.

SPRING OILERS.

Housel Sales Co., B Street, Buffalo, N. Y.

SPRINGS FOR AUTOMOBILE SUSPENSION.

Marburg Bros., Inc., 1790 Broadway, New York. (Marburg-Hagen.)

Tuthill Spring Co., 756 Polk St., Chicago. (Titanic Unbreakable.)

SPROCKETS.

Boyd, F. Shirley, 175 Massachusetts Ave., Boston. (Baldwin.)

TEST CLIPS.

Mueller & Co., R. S., 431 High Ave., S. E., Cleveland, O. (Universal.)

THERMOS CASES.

Dover Stamping & Manufacturing Co., Cambridge, Mass.

TIMERS.

Motor Specialties Co., Waltham, Mass. (Bemus.)

WHEELS, WIRE.

Hoggson & Co., S. H., Thames Bldg., New York, N. Y.

Houk Mfg. Co., 1709 Elmwood Ave., Buffalo, N. Y. (Houk Detachable.)

TIRE CHAIN GRIPS. (See Chains.)

TIRES, CASINGS AND INNER TUBES.

Federal Rubber Mfg. Co., Milwaukee, Wis. (Federal.)

Goodyear Tire & Rubber Co., Madison St., Akron, O.

Polack Tyre & Rubber Co., 246 W. 59th St., New York City. (Polack.)

TIRE TOOLS.

Housel Sales Co., B Street, Buffalo, N. Y.

TOPS AND ATTACHMENTS.

Highland Body Manufacturing Co., Station P, Cincinnati, O. (Highland Coupe.)

Springfield Metal Body Co., 20 Medford Ave., Springfield, Mass.

TRACTORS.

Knox Motor Associates, Springfield, Mass. (Knox.)

TRANSFORMERS.

Packard Electric Co., The, Warren, O.

TRUCKS AND TRACTORS. (See Cars, Commercial.)

VALVE GRINDING COMPOUND.

Faw, J. H., Inc., 41 Warren St., New York City. (Eureka.)

VALVE TOOLS.

American Valve Tool Co., 589 Hudson St., New York, N. Y.

VIBRATORS.

J & B Mfg. Co., Pittsfield, Mass.

VULCANIZERS.

Mabey's Electric & Mfg. Co., Indianapolis. (Mabey's Electric.)

Vanderpool Co., Springfield, O.

Williams Foundry & Machine Co., Akron, O.

WARNING SIGNALS.

Seiss Mfg. Co., 444 Dorr St., Toledo, O.

WELDING OUTFITS.

Dyer Apparatus Co., Cambridge, Mass. (Dyer.)

Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill. (Oxyacetylene Combination Outfit.)

Prest-O-Lite Co., Indianapolis, Ind.

Searchlight Co., 1012 Karpen Bldg., Chicago, Ill.

Waterhouse Welding Co., 3 Pelham St., Boston, Mass.

WRENCHES AND COMBINATION OUTFITS.

Coes Wrench Co., Worcester, Mass.

Faw, J. H., Inc., 41 Warren St., New York City. (Walden.)

Lane, Will B., 180 No. Dearborn St., Chicago. (Unique Ratchet.)

Mossberg Co., Frank, Attleboro, Mass.

Walden Mfg. Co., 73 Commercial St., Worcester, Mass.



**This car
— with this additional limousine top
— all for \$950**

f.o.b. Toledo

Overland Model 83 with this Detachable Limousine Top makes a most comfortable and attractive closed car.

In warm weather you have your touring car, with one man top, windshield and side curtains.

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Also Manufacturers of Willys-Knight Automobiles

THE AUTOMOBILE JOURNAL

VOL. XL, No. 4

OCTOBER 10, 1915

Price, \$1.50 the Year

STUTZ STAMINA TRIUMPHS.

Great American Racing Car Breaks All Records in Astor Cup and Keeps Running When Other Cars Break Down Under the Strain.

STAMINA won the Astor Cup 350-mile race with which the new Sheepshead Bay speedway was inaugurated Saturday, Oct. 9. Gil Anderson, in his Stutz, came home first, having maintained an average speed of 102.60 miles per hour, followed by Tom Rooney in another Stutz at a speed of 102.19 miles per hour. This was five miles an hour faster than the time made on the Chicago speedway for a similar distance, and faster by about a mile than Resta's 100-mile record on the same Illinois track. No man ever before travelled the same distance at an equal speed.

The race was another astounding demonstration of the sturdiness and consistency of the Stutz racing cars. They did not show the speed for short distances that is possessed by the Peugeots, for Resta turned some laps at 110 miles per

hour, but at the end of the race all five Peugeots had been eliminated and the Stutz took first and second money.

The Stutz, in short, proved to have all the speed any car in the present state of the art can endure—and plenty to break every record for the distance. Its performance was a terrific climax to a racing season that has seen every record broken time and again.

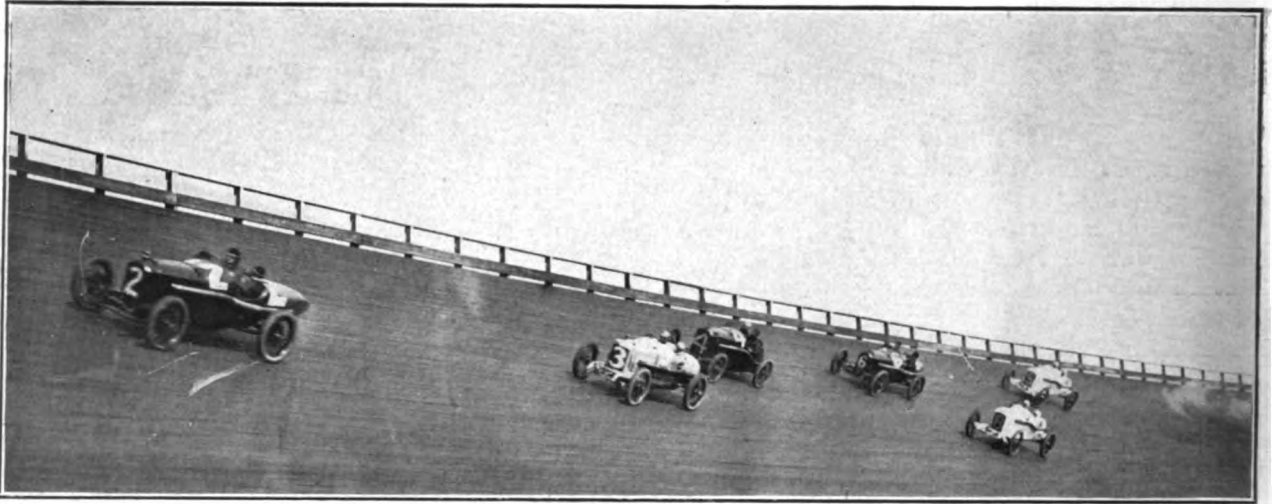
Europe Badly Beaten.

Sturdy American construction took all the honors from the faster but less substantial European cars. Of the six cars to finish only one, the last, was of European make.

The track with its parabolic curved banks proved so fast and so safe that no car could take full advantage of its possibilities. The European machines burned themselves up one after another. Usually it was the



The Cars Lined up for the Start.



Three Stutz Cars and Three Peugeots in a Brush.

lubrication that failed, as shown by the large number of seized pistons and broken connecting rods.

The superior stamina of the Stutz cars, driven with full knowledge of the disastrous effects of speeds over 100 miles an hour upon motor mechanism, aided by the best of judgment, won the victory.

The third place was narrowly missed by Bob Burman in a Peugeot, who, two laps from the finish, went down with a broken motor. That gave third place to Eddie O'Donnell, in a Duesenberg, at a speed of 95.45 miles an hour; fourth to Pete Henderson, in another Duesenberg, at 92.21 miles an hour; fifth to Tom Alley, in an American Ogren, at 91.97 miles per hour, and sixth to Carl Limberg, in a Delage, at 84.22 miles per hour. Ora Haibe, in a Sebring, and Ira Vail, in a Mulford special, were still on the

track and running when the race was called off. They will receive their prizes. All of the remaining cars of the 20 to start had broken down and four prizes, totalling \$3400, were turned back into the speedway treasury.

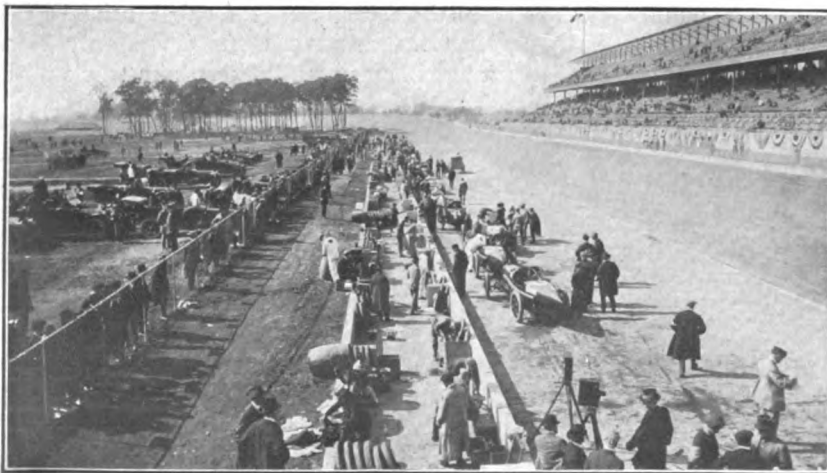
The Stutz team won this race as it has won its previous victories this year. During the early stages it trailed the leaders instead of making the pace, waiting patiently for too great a fury of speed to break them down. It showed the effect of great team work.

Stutz Held Men Down.

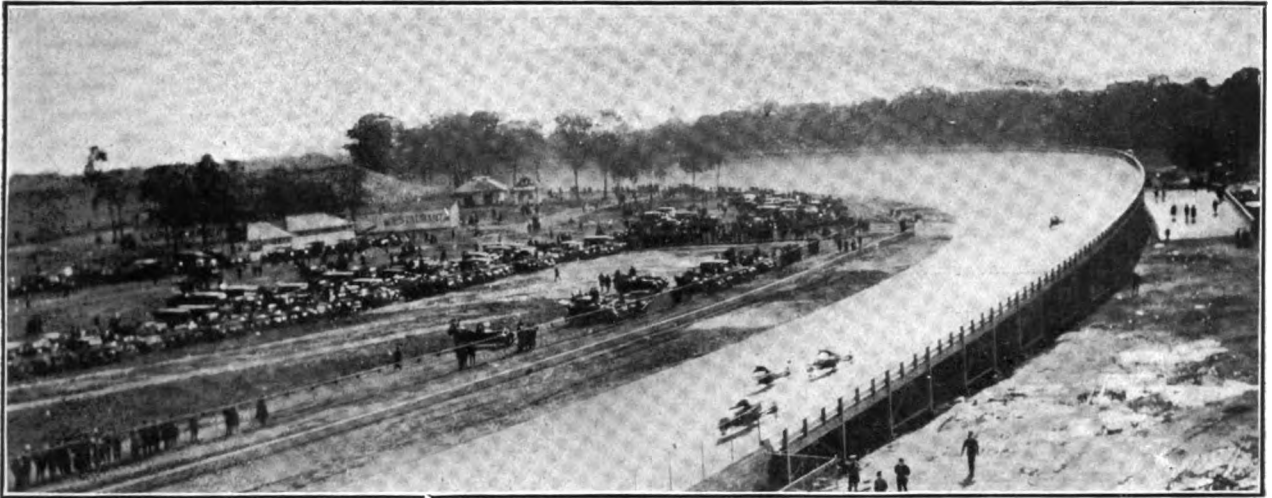
Harry Stutz, who manages his own team, kept in communication with his drivers from the pits. He held them to as fast a pace as he thought safe and never allowed them a shade of speed that was not necessary to maintain their positions.

The excellent qualities of the track are shown by the fact that nothing approaching an accident happened during the day. The Peugeots, which were making a speed in excess of 105 miles an hour, found it necessary to change tires frequently. The excellent balance of the Stutz, and its steady, though very fast pace, enabled Anderson to finish with only one stop and that was for gasoline. Rooney, who took second, changed one tire.

Rooney is a new driver, and this was his first important race. He has been for some time mechanic for Earl Cooper. He drove with the consistency, good judgment and



The Pits and the Track Toward the First Bend.



The Cars Rounding One of the Turns with Parabolic Banking.

determination which has been characteristic of Stutz drivers since that car began competing in the leading American races. He proved himself the equal of men who have long been leading race drivers.

The deadly qualities of high speed sustained for a long time is shown by the fact that only eight of the 20 which started were running when the race was over. It is true that some of the European cars used have been raced in all the leading events this year and might be expected to be badly worn. Owing to conditions in Europe it is naturally difficult to secure perfect repairs from the factory.

De Palma Abandons Mercedes.

De Palma, who has used his Mercedes in all the leading events this year, drove his Stutz instead, and there was doubt from the first that Resta's Peugeot would last through the race even though the pace were not as deadly as it proved to be.

But, at the same time, several new Peugeots had been received from France and were driven in the race. There were several new Delages also. These cars showed no better performance than the veterans that have been performing on American tracks all through the year—so the result is a clean cut victory for American construction, as exemplified in the Stutz. The losers have no explanations to make.

Silvertown cord tires were

again used on all cars, except Tom Alley's Ogren. Anderson got through without a tire change. O'Donnell, who was third, did not stop for any cause. The Ogren, equipped with Nassau casings, came through without a single tire trouble.

When the race started neither the F. R. P. nor the Erwin special, which had qualified, came to the wire. There were five rows of four cars each, as they spun around the track for the preliminary lap.

Their positions, as usual, were determined by the speed made in the elimination trials and Resta, one of whose specialties is high speed in elimination trials, had the pole. He covered the first lap at a little better than 100 miles an hour and as his motor warmed up increased the pace. Aitken and the other Peugeot drivers, with Oldfield close up, led the van. The three Stutz cars,



Anderson, Harry Stutz and Rooney After the Race.

HOW THE CARS FINISHED.

Driver	Car	Time	Speed	Prize
G. Anderson	Stutz	h. m. s.	per hour	
Rooney	Stutz	3:24:42	102.60	\$20,000
O'Donnell	Duesenberg	3:25:29	102.19	10,000
P. Anderson	Duesenberg	3:39:55	95.45	5,000
Alley	Ogren special	3:47:26	92.21	4,000
Limberg	Delage	3:48:21	91.97	3,000
Haibe	Sebring	4:09:23	84.22	2,000
Vail	Mulford special	Running when race was called off.		1,400
Burman	Peugeot	Running when race was called off.		1,200
Aitken	Peugeot	Broke transmission, 346 miles.		
De Palma	Stutz	Cracked water jacket, 242 miles.		
Le Cain	Pugh special	Froze piston, 206 miles.		
Rickenbacker	Maxwell	Broke clutch, 156 miles.		
Resta	Peugeot	Burned out bearing, 108 miles.		
Wilcox	Peugeot	Broke connecting rod, 104 miles.		
Pullen	Maxwell	Motor trouble, 74 miles.		
Cooper	Stutz	Broke connecting rod, 58 miles.		
Mulford	Peugeot	Broken valve, 48 miles.		
Oldfield	Delage	Broke connecting rod, 16 miles.		
Haupt	Duesenberg	Broke connecting rod, 16 miles.		
		Disqualified for pushing car, 252 miles.		

with Anderson, Rooney and Cooper, tailed the first division.

Mulford pressed Resta hard for a lap or two with Oldfield hugging his rear tires. But at eight laps both Mulford and Oldfield went out almost before the race was well started. The trouble in both cases was broken connecting rods. Mulford's car was a brand new Peugeot.

When a tire blew out on Burman's Peugeot a little later in the race his pit men gave a good exhibition of high speed pit work by putting on a new wheel in 20 seconds. The electric timing device was not in working order during the first 50 miles and it is likely that the contest board of the A. A. A. will allow no records for that part of the race.

Wilcox's Peugeot a little later required a new tire also and it took 45 seconds to replace it. It was noticeable that the Peugeots were wearing out tires rapidly, while the Stutz required very few stops from that cause. The parabolic banking at the curves was such that there was no tendency to skid, even when the speed touched 110 miles an hour. The driving was perfectly safe and easy. It is probable that the track can stand speeds up to 135 miles an hour on the curves before it will be necessary to shut off for them.

A tire on Aitken's new Peugeot blew out at 38 miles. At 44 miles Cooper's Stutz was missing badly and when the car was taken into the pits it was found that a valve had been broken. Haibe had spark plug troubles on his Sebring and was forced to stop six minutes at the pits on that account.

Resta was speeding around the track at this time to the limit of his car's capacity. He was timed for the 22nd lap at 65 seconds, which is close to 110 miles per hour. Lap after lap he was making close to 107 miles. In the 23rd lap he stopped for a tire change and so closely behind were the Stutz cars that he at once lost the lead to Anderson. His stop was for only 27 seconds.

In the 53rd mile Pullen's Maxwell was taken



Drivers, Mechanicians, Pit Men and Race Followers Lined up on the

out with a broken connecting rod. Anderson, who was leading at 60 miles, had averaged 104.4 miles up to that time. Aitken had to make his fourth change of tires in the 64th mile. Anderson maintained the lead to 80 miles with Rooney following and Resta pursuing persistently. His time at the 80-mile post was 103.97 miles per hour. Resta made his 41st lap at 109 miles an hour and got back into third place.

Wilcox's Peugeot, which was sent to the pits with spark plug trouble and to get gasoline, was taken out because the motor could not be put in condition for running again. Resta took the lead at 84 miles and was holding it in the 100-mile lap. His speed on individual laps was over 109 miles an hour and for the 100 miles it averaged 104.37 miles per hour. This was nearly a minute and a half better than the record made in the 100-mile invitation race at the Chicago track, which had been the fastest up to that time. Rooney, Anderson and Rickenbacher were in the second division, running about half a lap behind Resta.

Resta's Motor Breaks.

A minute later, just after passing the 104-mile mark, Resta's car began to slow down and crawled up the stretch. He had to push it home. He had asked more than the mechanic could give and a connecting rod had snapped.

RACE RESULTS THIS YEAR.

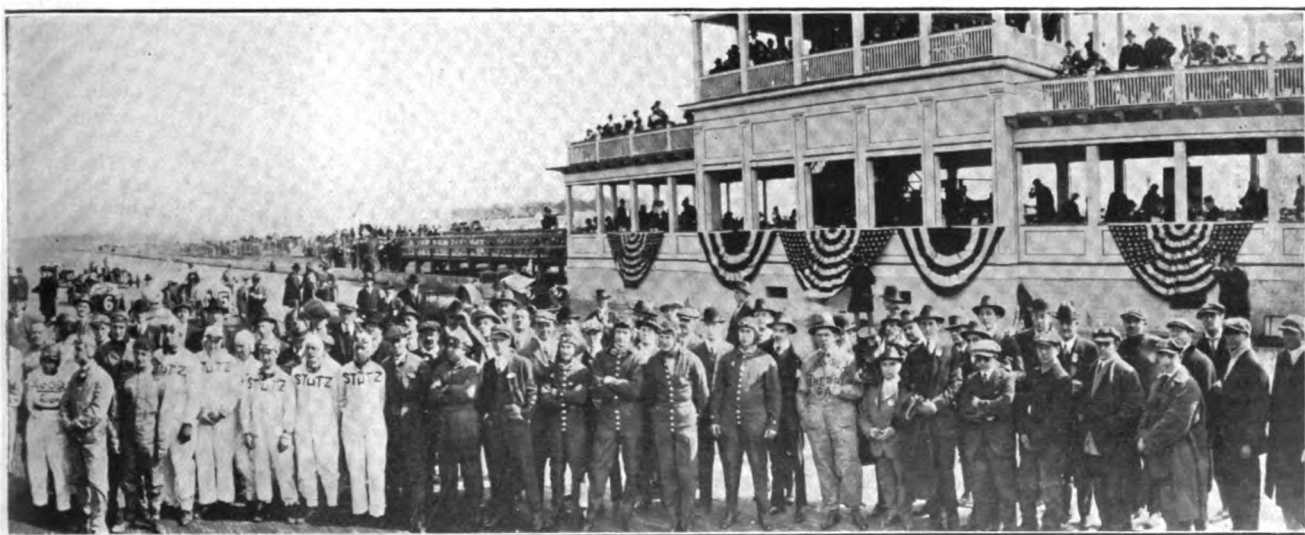
The fastest race run on an American track previous to this year was the Indianapolis 500-mile event on Memorial Day, 1914, which was won by Rene Thomas, a French driver, in a Delage. His time was 82.47 miles per hour. Better cars, better driving and above all the construction of modern board speedways has this year enormously increased the speed, as shown in the following table:

Place	Winner	Car	Distance	Track	Speed
Indianapolis	De Palma	Mercedes	500 miles	brick	89.84
Chicago	Resta	Peugeot	500 miles	board	97.58
Omaha	Rickenbacher	Maxwell	300 miles	board	91.07
Des Moines	De Palma	Stutz	300 miles	board	87.00
Chicago	Resta	Peugeot	100 miles	board	101.86
Elgin	Cooper	Stutz	300 miles	dirt	74.79
Elgin	Anderson	Stutz	300 miles	dirt	77.25
Twin Cities	Cooper	Stutz	500 miles	concrete	88.35
Providence	Rickenbacher	Maxwell	100 miles	asphalt	67.00
New York	Anderson	Stutz	350 miles	board	102.66

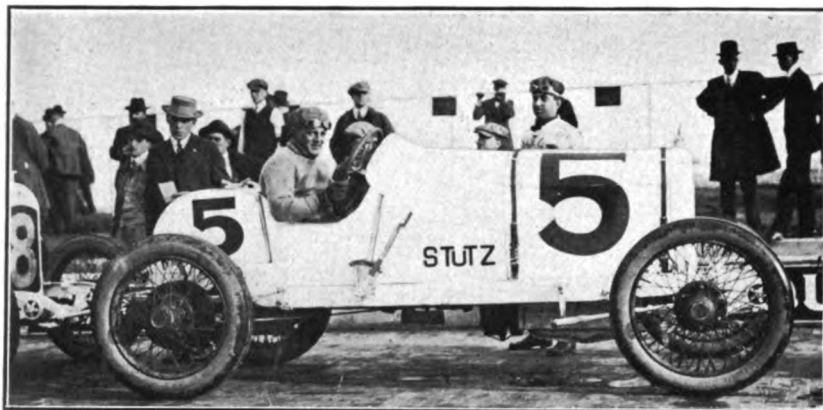
Anderson again took first place, with a good chance of holding it until the end, unless something unforeseen happened. Rickenbacher retired at 108 miles with a burned out bearing and a broken connecting rod. Anderson's time at 120 miles was 103.52 miles per hour. He still led at 140, but by a smaller margin and his speed was 103.30.

Aitken's Peugeot was second, Burman's third and Rooney's Stutz fourth. De Palma was fifth, followed by O'Donnell, Vail, Henderson, Limberg, Le Cain, Haupt and Alley.

At 160 miles Vail, driving a Mulford special, was overcome by the fumes of burning castor oil and had to give way to George Thebold, his relief driver. Thebold was the only relief driver used in the race. At 156 miles Le Cain had gone out of the race because of a broken clutch on the Pugh Brothers special entered by the Providence firm of motor car dealers.



Board Track Before the Grandstand Shortly Before the Race Started.



Gil Anderson and His Winning Car.

Aitken was gaining slowly on Anderson, and at 160 miles was only 26 seconds behind. Anderson's time was 103.18 miles per hour at that mark. Rooney was third, and Burman fourth. At this stage it was a race between two Stutz cars and two Peugeots.

At 186 miles Aitken took the lead while Anderson stopped for gasoline—his only stop during the race. Aitken increased his lead to the better part of a lap. He had a minute on Anderson at 200 miles. Rooney was still leading Burman, with De Palma fifth. There were now only 11 cars left on the track.

At 206 miles De Palma's car was withdrawn because of a seized piston. Aitken was far ahead and it looked like a fight between the Stutz cars and Burman for second place. Burman was second at 220 miles, with Anderson and Rooney third and fourth. The leader was doing 103.30 miles per hour and the Stutz cars, 102.35.

Harry Stutz, observing the way the cars were going out through the inability of their lubrication systems to cope with the engine speed and heat required by the pace, was holding his men in check, confident that Aitken would come to grief before the end of the race.

Aitken stopped for gasoline and Anderson made up some of the intervening distance, but the stop was for only 30 seconds. The Peugeot

was still leading when at 242 miles disaster overtook it. Aitken rolled up to the pit thinking that his spark plugs had gone wrong and while he stood there water came gushing through the exhaust, showing that the cylinder casting was cracked.

All eyes now turned to Burman and the two Stutz cars. Rooney, the novice was leading at 260 miles, by a margin of hundredths of a second. The electric timing device recorded the passing of Rooney, Anderson and Burman at the same point so closely were they bunched. The time at this point was 102.46 miles per hour.

Twelve miles further on Rooney went to the pits for gasoline and the next time around Burman also stopped for fuel. His pit work was slow and he got away only after most of his car had been almost inundated with gasoline. He lost a minute and a half.

At 280 miles the order was Anderson, Rooney

MECHANICAL DETAILS OF THE CARS.

Car	Driver	Cylinders ..	Bore	Stroke	Piston Displacement ..	Spark plugs	Carburetor ..	Magneto	Tires	Wire wheels	Wheelbase ..
Peugeot	Resta	4	3.60	6.67	274	K. L. G.	Zenith	Bosch	Silvertown	Rudge	106
Peugeot	Aitken	4	3.60	6.67	272	Oleo	Zenith	Bosch	Silvertown	Rudge	106
Delage	Oldfield	4	3.66	7.09	298	Rajah	Claudel	Bosch	Silvertown	Rudge	104
Peugeot	Burman	4	3.65	7.10	296	K. L. G.	Zenith	Bosch	Silvertown	Rudge	105
Stutz	Anderson	4	3.81	6.50	296	Bosch	Stromberg	Bosch	Silvertown	Houk	102
Peugeot	Wilcox	4	3.60	6.67	274	Oleo	Zenith	Bosch	Silvertown	Rudge	106
Stutz	Rooney	4	3.81	6.50	296	Bosch	Stromberg	Bosch	Silvertown	Houk	102
Stutz	Cooper	4	3.81	6.50	296	Bosch	Stromberg	Bosch	Silvertown	Houk	102
Duesenberg	O'Donnell	4	3.75	6.75	297	Bosch	Zenith	Bosch	Silvertown	Rudge	106
Maxwell	Rickenbacker	4	3.75	6.75	298	Bosch	Zenith	Bosch	Silvertown	Rudge	101
Mulford Special ..	Vail	4	3.98	6.00	299	Rajah	Master	Bosch	Silvertown	Rudge	101
Pugh Special	Le Cain	4	3.98	6.00	299	Bosch	Master	Bosch	Silvertown	Houk	106
Sebring	Haibe	4	3.98	6.00	299	Rajah	Master	Bosch	Silvertown	Rudge	102
Duesenberg	Haupt	4	3.98	6.00	299	Rajah	Schebler	Bosch	Silvertown	Rudge	106
Maxwell	Pullen	4	3.75	6.75	298	Bosch	Zenith	Bosch	Silvertown	Houk	105
Peugeot	Mulford	4	3.60	6.67	274	Rajah	Zenith	Bosch	Silvertown	Rudge	106
Delage	Limberg	4	3.66	7.09	298	K. L. G.	Zenith	Bosch	Silvertown	Rudge	110
Stutz	De Palma	4	3.81	6.50	296	Bosch	Stromberg	Bosch	Silvertown	Houk	102
Ogren	Alley	4	3.98	6.00	299	Rajah	Rayfield	Bosch	Nassau	Rudge	102

and Burman. Anderson's car was running perfectly and Rooney's was doing equally well. From this point Anderson took the lead and drove like clock work, his time for various laps being almost identical. At 300 miles his rate of speed was 102.56, only four-tenths of a second slower than at the end of the race.

Burman had extreme hard luck. He was behind Anderson and Rooney, but seemed to have third place assured when in the 346th mile, two laps from the finish, one of the gears of his transmission broke and he went out.

300-Inch Cars in Race.

From the time that Resta and the other Peugeotts began to drop, Anderson and his team mate attempted nothing faster than 103 miles an hour and steadily kept that pace. It was enough to break the record and win the race and greater

97,000 people in the grounds and disposed as follows: Grandstand, 35,000; field stand, 22,000, and field, 40,000. At that rate the grandstand would yield \$175,000, the field stand \$44,000, the field \$80,000, giving a total of \$299,000. The return from concessions of one sort or another would make the total more than \$300,000.

The connection of Vincent Astor and Harry S. Harkness made the event a big one for society and the very wealthy were there in great numbers. The weather was perfect and the occasion in every way a great success. A large number of ambulances and 40 surgeons were on hand, but the only injury they treated was that of a man who cut his hand opening a pop bottle.

ENGINE EXHAUST GASES DANGEROUS.

When a gas engine is running it generates a variety of deadly gases, according to Dr. Edwin F. Bowers. Cases have been known where death has resulted from running an engine in a small and unventilated garage. In one case a Chicago doctor working over his car in his garage died before help reached him, and in another the victim of the gas lost his reason a week later.

Unexploded gasoline will asphyxiate, as will the carbon monoxide which is given off by the engine. It has lately been contended that many of the fatal accidents to aviators have come about because they were overcome by gas fumes.

Resistance to the gas does not depend on physical strength and a strong robust man may succumb quicker than a nervous, slight woman. If a pulmotor and crew are not available the best remedies in case of such asphyxiation are artificial respiration and slapping the face sharply with towel dipped in cold water and giving the patient strong coffee. Doctors and nurses should be called at once and should administer hypodermics of strychnine or nitro-glycerine.

CHANDLER NON-STOP RUN.

Almost without advance notice a Chandler "Six" car started recently from Tia Juana, Mexico, on one of the most strenuous non-stop runs that has ever been attempted. The car and crew will attempt to reach the Canadian border without stopping either the engine or the wheels of the car. The distance for the trip is 1789 miles.

Whether the non-stop feature can be carried out or not, so far as the wheels are concerned, will depend on whether or not tire trouble is encountered. Of course it will be necessary to stop the car to change tires.

HOW CARS QUALIFIED.

	Lap Time	M. P. H.
Mulford (Peugeot).....	1:05.35	109½
Resta (Peugeot).....	1:08.10	106
Aitken (Peugeot).....	1:08.65	105½
Oldfield (Delage).....	1:09.25	104
Burman (Peugeot).....	1:09.78	103
Anderson (Stutz).....	1:10.84	101½
Rooney (Stutz).....	1:10.93	101½
Wilcox (Peugeot).....	1:11.00	101½
Cooper (Stutz).....	1:11.80	100½
O'Donnell (Duesenberg).....	1:12.00	100
Rickenbacker (Maxwell).....	1:12.72	99
Pullen (Maxwell).....	1:13.00	98½
Lemberg (Delage).....	1:15.77	95
Henderson (Duesenberg).....	1:16.60	94
Vall (Mulford Special).....	1:16.50	94
Le Cain (Pugh Special).....	1:17.25	93½
Halbe (Sebring).....	1:17.44	93
De Palma (Stutz).....	1:19.48	91
Haupt (Duesenberg).....	1:20.05	90
Alley (Ogren).....	1:23.65	86
Porporato (F. R. P.).....	1:24.16	85½

speed would have, under the circumstances, been useless and foolhardy.

The limit in size for cars entered in the race was 300 inches cubic piston displacement, as it has been in most of the other big races this year. The last previous important race held near New York was the Vanderbilt Cup, which Harry Grant won at a little more than 62 miles an hour. Much smaller cars exceeded that mark in this race by nearly 40 miles an hour.

The race was a tremendous success from a financial point of view. Everard Thompson, general manager of the speedway, estimated that between 90,000 and 100,000 people saw the race. Most of the New York newspaper men seemed to think that this overestimated the attendance slightly, but they conceded that it was the largest crowd that had ever attended a sporting event in the metropolitan district, if not in the world.

The official estimate was that there were

The men are eating and sleeping in the machine and taking gasoline on the run from Chandler dealers along the way. This is put into the tank by means of a long curved funnel. The run attracted such wide attention in southern California that a moving picture company sent a camera man to get some pictures of the trip for its news film. This is the first time that a film company has devoted space in such a film to an automobile test run without charge to the manufacturers. The car is equipped with Goodyear tires, Gray & Davis electric system, Klaxon and Sparton horns, Boyce motometer, Stewart speedometer and vacuum fuel feed, Bosch spark plugs, Rayfield carburetor and Monogram oil.

COUZENS LEAVES FORD COMPANY.

James Couzens, vice president and general manager of the Ford Motor Car Company, and Henry Ford's right hand man since the business was started, has resigned from the company. His reason, as reported in dispatches, is that he could not agree with Mr. Ford's recent public utterances, particularly those having to do with his opposition to "preparedness."

The two men met for luncheon Tuesday, Oct. 12, at the Detroit club, and their difficulties came to a head during the conference. Mr. Couzens immediately afterwards announced that he had resigned from the company, his resignation to take effect immediately. He said that relations between himself and Mr. Ford had been nearing the breaking point for weeks.

"I have disagreed with Mr. Ford's public utterances on finance unpreparedness and everything else of late. I cannot be carried along on that kind of a kite. I was quite willing to work with Henry Ford, but not for him. We started in the automobile business together and it was through my efforts that the Ford Motor Company was built up around one man—Henry Ford."

It is understood that the board of trustees of the Ford Motor Company will accept the resignation at once. Mr. Couzens retains his financial interest in the concern, which amounts to several million dollars.

Mr. Couzens was a clerk in the employ of A. Y. Malcolmson, a Detroit coal dealer, when the Ford Motor Company was started. Mr. Malcolmson was financing Ford in part and he got Couzens into that concern. Couzens invested \$400 of his own money, \$500 which Malcolmson gave him as a bonus and \$100 that he borrowed

from his sister, bringing his original investment up to \$1000. He took charge of the office, while Ford assumed the production end of the business. He became secretary and business manager, while Ford was president and general manager. The company paid a two per cent. dividend when it was five months old, a 10 per cent. dividend when it was six months old and a 68 per cent. dividend when it was nine months old.

Mr. Couzens is a member of the Detroit Street Railway commission, has been president of the Detroit Board of Commerce, is president of one Detroit bank and a director of two others.

LINCOLN HIGHWAY FOR WAR USES.

In an article on the value of a transcontinental road like the completed Lincoln highway for strategic purposes, A. F. Bement, secretary of the Lincoln Highway Association, declares that with the present railroads it would be impossible to take 100,000 men from the East to the Pacific Coast for defense purposes in a month.

There are only six transcontinental railroads and not one of these is double tracked for the whole distance. If 100,000 men could be placed there they could not be supplied with food sent also from the East.

But, he says, with the Lincoln highway paved all the way the motor car factories of the United States could build cars fast enough to carry 138,000 men to the coast in one month. He points out the fact that the rapid mobilization and movement of the troops in the European war has shown the enormous military importance of good roads.

The article is a strong plea, linking up the Lincoln highway propaganda with the movement for greater military preparedness.

ROAD ENCIRCLES ISLAND OF HAWAII.

The improvement of the Keaumuku road, at the north end of the island of Hawaii, which has just been completed at a cost of \$55,000, provides a splendid modern road 240 miles long, completely circling the island.

This circular trip is becoming increasingly popular with tourists, as it affords a view of much marvelous tropical scenery and glimpses of the fast vanishing native life. There are excellent hotel accommodations. The trip can be made in two days. Within the circle are four volcanoes—two extinct, one very active and one intermittently active.

RAILROADS START SAFETY CAMPAIGN.

WITH the rapid growth in the use of motor cars, the frequency of accidents at railroad crossings has increased in proportion. The Baltimore & Ohio railroad reports that during the past year 29 automobiles were struck at its crossings, which was an increase of 17 accidents and 23 deaths over the number the year before.

This is a matter of much concern to the railroads. It frequently means damage suits, and if the number of accidents is not speedily checked it is sure to result in an overwhelming demand for the abolition of all grade crossings. To remove the grade crossings would cost hundreds of millions of dollars, without adding to the revenue of the roads.

So, following the lead of the Southern railroad, the Baltimore officials are attacking the problem of a direct appeal to motorists. This, it is hoped, will serve to reduce the accidents and even more will tend to make public opinion regard the automobilist as responsible for most of the accidents. And without doubt car drivers are frequently to blame.

The Baltimore & Ohio is making observations along busy streets that cross its lines. Numbers of the cars that pass the railroad are taken with notes concerning the manner in which the cars were driven and a letter is then written to the owner of the car, calling attention to carelessness if it existed and asking that greater caution be exercised in the future.

This personal appeal, based on the driver's own method of crossing the tracks, is likely to have as powerful an appeal to him as any that could be made.

The first observation of this sort was made at Uniontown, Penn., Sept. 12, when 729 automobiles crossed the railroad tracks at Fayette street between 6 o'clock a. m. and 6 p. m.

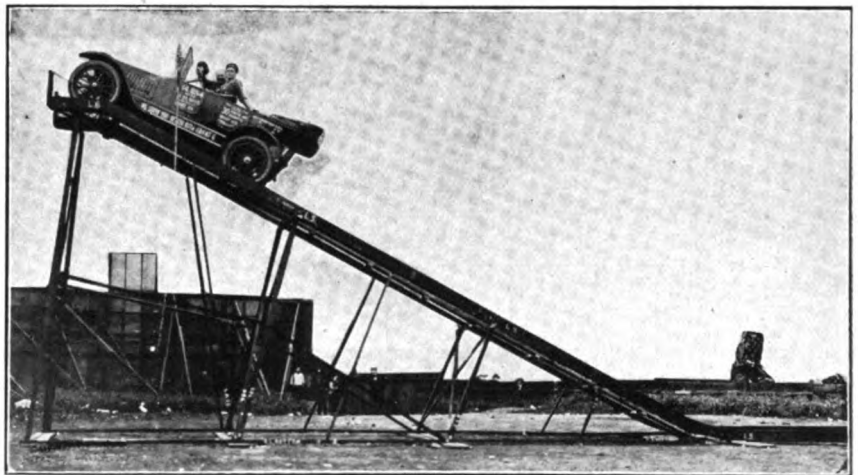
Of these only 28 stopped to see whether a train were approaching, and 24 of those were stopped because a train was using the crossing. Of the 701 remaining vehicles 505 did not slow down. In 52 instances the drivers looked in one direction, while 542 did not look at all. There

were 135 drivers who looked in both directions.

Density of population seems to have little to do with the number of crossing accidents, as there seems to be fully as many in the country districts as in the towns.

GRANT SIX IN SEVERE TEST.

The new Grant six-cylinder model is put through a severe test for power and flexibility. In the rear of the Chicago salesrooms a steel frame work with a 50 per cent. grade has been erected. A car is started on a runway 24 feet back and then sent up the 36-foot incline, as is shown in the accompanying illustration. Though the brakes are set and the wheels locked, the car



A Grant Six Being Tested for Hill Climbing Power on a Special Steel Track of 50 Per Cent. Grade.

rolls backward to the ground through its own weight. The grade is too steep to allow the tires to secure a grip on the wooden surface. This exhibition of the hill climbing powers of the Grant six is attracting wide attention.

KING IN HIGH GEAR TEST.

For the benefit of southern California motorists a King eight recently made an 800-mile trip from the Mexican border to Santa Barbara with the gear sealed in high. The run was made under the supervision of the Motor Club of Southern California. It traversed such mountain passes as Torrey Pines Grade, Conejo Grade, Arrowhead mountain, Mount Rubidoux, Lookout mountain and Poway Grade. Gasoline consump-

tion averaged 14 5/14 miles to the gallon. A large part of the trip was made at an average speed of 40 miles per hour. The traffic of Los Angeles and Santa Barbara had to be threaded. The mechanism was sealed and the seals inspected at both ends. In some cases when the car had to back up it was pushed back by hand as the reverse gear had been removed from the case.

GREAT TRAFFIC ON LINCOLN WAY.

Reports from Orrs ranch, in Toole county, Utah, where there is a supply station in the heart of the desert, indicate an increase of 560 per cent. in traffic over the Lincoln highway since last year. In August, 1914, 56 parties passed that point. In August of this year 314 parties passed, which shows an increase of 560 per cent.

ELECTED TO N. A. C. C.

The Consolidated Car Company, Detroit, Mich., manufacturer of Abbott-Detroit cars, has been notified of its election to membership in the National Automobile Chamber of Commerce at a meeting held in New York City in October. This enabled the Consolidated company to participate as a member in the drawing for show space for the New York and Chicago shows.

PAIGE CAPACITY 150 CARS A DAY.

Additions to its plant erected during the summer have given the Paige-Detroit Motor Car Company a capacity of 150 cars a day. The great demand for cars was foreseen by the Paige officers months ago, and materials were contracted for in sufficient quantity to permit the plant to be operated at full capacity. It is now one of the few companies whose production is not suffering from lack of material and parts. Mechanical conveyors and other labor saving machinery have been installed in the plant.

SPACE DRAWN FOR NEW YORK SHOW.

One of the largest meetings ever held by the National Automobile Chamber of Commerce took place when the drawings of space for the New York and Chicago shows were made. There will be no extra space at either show. The committee appointed to recommend a uniform time for announcing models reported that no agreement was possible. It was decided to standardize treads at 56 inches after July, 1916. The traffic department reported record shipments

and a difficulty in getting enough freight cars.

Members of the N. A. C. C. were served first with space at both New York and Chicago, the cars receiving allotments being as follows:

Overland,	Moon,	McFarlan,
Bulck,	Marmon,	Cunningham,
Studebaker,	Velle,	Westcott,
Cadillac,	Apperson,	Mitchell,
Maxwell,	Auburn,	Haynes,
Hudson,	Mercer,	Oakland,
Reo,	Fiat,	Briggs-Detroit,
Dodge,	Moline,	Imperial,
Chalmers,	Lozier,	Marion,
Hupp,	Scripps-Booth,	Saxon,
Packard,	Great Western,	Case,
Pierce-Arrow,	Briscoe,	Argo,
Chevrolet,	Cole,	Empire,
Paige-Detroit,	Pathfinder,	Grant,
Franklin,	Inter-State,	Paterson,
Chandler,	King,	Premier,
Austin,	Regal,	Holler,
Kline,	Glide,	Jackson,
Stearns,	Elkhart,	Abbott-Detroit,
Locomobile,	Kissel,	Anderson,
Allen,	White,	Baker R. & L.,
Stutz,	Lexington-Howard,	Ohio,
Peerless,	Olds,	Milburn,
Pullman,	Winton,	Waverley,
National,	Jeffery,	Woods.

Among the others who secured space were:

Metz,	Enger,	All Steel,
Crow,	Remington,	Sun,
Davis,	Dort,	Sterling,
Trumbull,	Owen,	Elgin,
Herff-Brooks,	Standard,	Farmack.
	Monitor,	

For the third time in three successive years the Willys-Overland Company has been awarded the most desirable space. Space is allotted according to the amount of business done during the year and for three years the Overland company has lead all other members of the National Automobile Chamber of Commerce.

In asking for awards of space each maker was obliged to submit sworn statements of the amount of business done.

MOSCO GIVES WARNING.

The Motor Specialties Company, Waltham, Mass., manufacturer of Mosco specialties for automobiles and motor boats, makes the following announcement: L. W. Sumner, who has been calling on the trade in connection with Excel jacks and Bemus timers in Kansas City, St. Louis and other western cities, is no longer connected with that company. The company also states that orders will be accepted only from authorized representatives, and that they will receive the usual exceptional Mosco attention to details and prompt delivery.

About 10,000 motor car licenses will be issued in Manitoba this year.

MOTOR STARTING AND CAR LIGHTING.

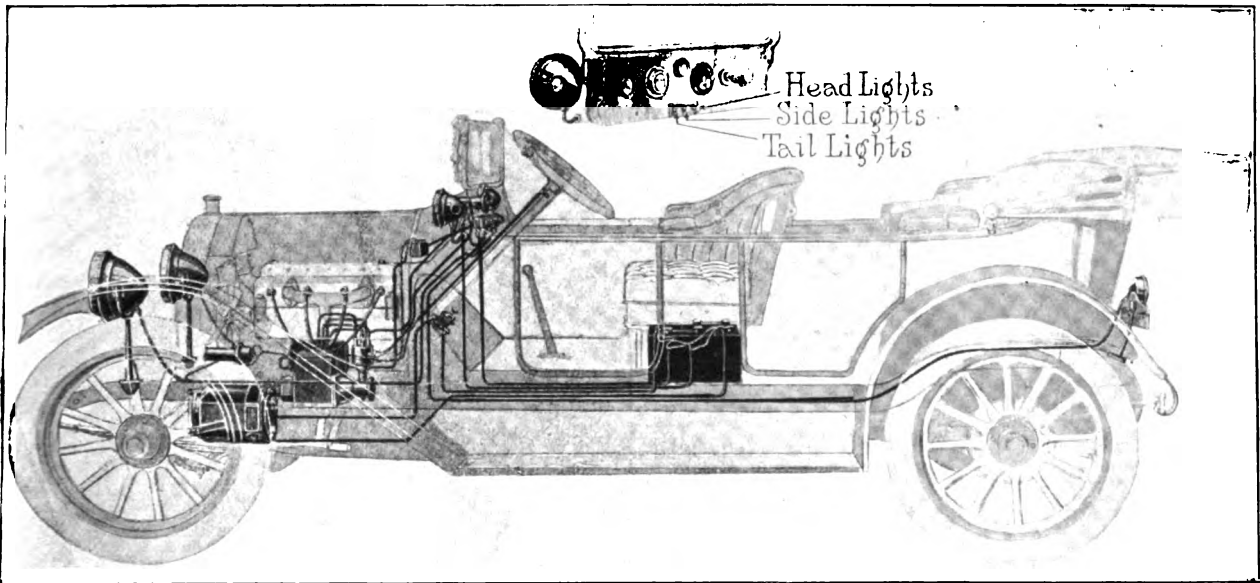
The Auto-Lite Two-Unit System, Operated by Six Volts Pressure, the Generator Being Combined with Ignition When Desired—Some of the Features of Design.

STARTING and lighting systems of any given make, even if but one type is produced as standard, will differ in installation in different makes of vehicle from the fact that with rare exception adaptations must be made to meet the requirements of the designers and engineers. This does not necessarily mean that there is a variance in design or construction, but to have some particularly desired quality of operation or control the equipment as it is installed in a machine of one make will be somewhat changed when compared with a similar system in another manufacturer's product.

Yet in any of these cases the system might be practically unchanged. This statement is made to emphasize the fact that there may be a number of installations, each differing in application, but the same in all essentials. Some requirements are such that the use of a different type motor or generator is desirable to meet a particular condition, but aside from this no other change is necessary.

Electrical Principles Do Not Vary.

The reader may benefit by the statement that electrical principles are never varied, but there may be difference in characteristics of machines,



An Auto-Lite Equipment Installed on a Touring Car, Showing the Relations of the Components of the System and the Location of the Wiring.

To illustrate: One engineer will require, because of the plan of his vehicle, a starting motor that will be coupled to the crankshaft through the timing gears, or by a special gear on the forward extension of the engine shaft, while another car will be equipped for a coupling through a flywheel external ring gear. Or perhaps there will be chain coupling by a sprocket on the crankshaft extension, or the motor may be placed on the cover of the transmission gearset case. In some instances the motors are installed horizontal, and in others vertical.

instruments and systems, each of which has been obtained to meet a specific condition, and while there may be sufficient variance to justify designation as "type" or model, the best distinction of a system is by the maker's name and the number of units that constitute it. Another fact that may be well to remember is that so far as science can forecast there will be no change in these principles, but there probably will be refinements and perfections as service experience is gained.

But instead of complications the systems will be simplified, so that there will be less proba-

bility of failure or damage; they will be safeguarded against many of the influences that might affect them, and construction will be such that they will better endure the operation of those who are careless or ignorant, for there will always be a large proportion of drivers who are indifferent to consequences of neglect or abuse.

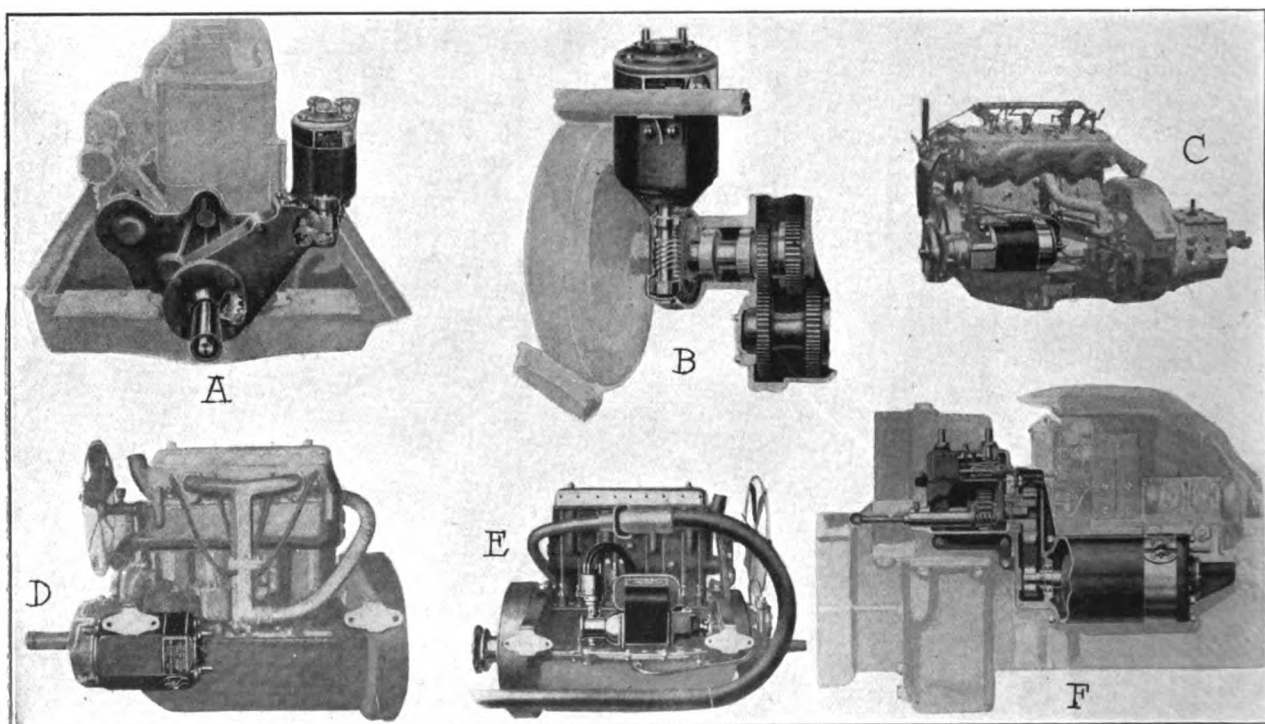
Auto-Lite Two-Unit System.

The Auto-Lite system, built by the Electric Auto-Lite Company, Toledo, O., is what is known as a two-unit type, this including a starting motor and a generator, with the instruments and equipment for regulation. This system is what is known as a "six-volt" construction, that is, the battery is designed to have a pressure of

the current for ignition, an ammeter, the lamps and the incidental junction box and other standard components of an electrical equipment of this character. The system provides a means for generating current for the battery, a motor for starting the engine, and the ignition current is taken from the generator, this obviating the need of a magneto, should there be desire to dispense with this means of ignition current generation.

May Supply Ignition Current.

As Auto-Lite systems are usually installed as new car equipment, and the battery must be used for starting and lighting, there is a very general tendency to use this for ignition purposes as well, and for this reason Auto-Lite systems with rare



Typical Installations: A, Vertical Motor with Chain Reduction to the Timing Gear, the Over Running Clutch Partly Exposed; B, Motor Installed Vertically on Transmission Gearset Case; C, Located to Drive Through Reduction Gears; D, Another Timing Gear Coupling; E, Generator-Igniter Driven by Outside Shaft; F, Flywheel Coupling, the Cut Housing Showing the Reducing Gears, the Driving Pinion and Switch.

six volts in the circuit, this requiring what may be regarded as a minimum in weight and capacity, and yet being ample to afford satisfactory and efficient service. Not only this, the generator and starting motor are correspondingly small, so that there is less weight to be carried, a factor of considerable importance in any power driven vehicle.

The system includes a generator, a motor, a battery, a circuit breaker, a foot switch by which to start the motor, a push button switch to control the lighting, an induction coil to intensify

exceptions include the induction coil. There are installations, however, in which a magneto is used, this being optional with the designing engineer.

The Auto-Lite generator is built very small, but it is none the less efficient. It is constructed in two types, one of which is known as model C-60. This is a permanent field generator, that is, the fields are permanent magnets in which the magnetism necessary for generating current at starting is afforded by three sets of imported tungsten steel horseshoe magnets. This gener-

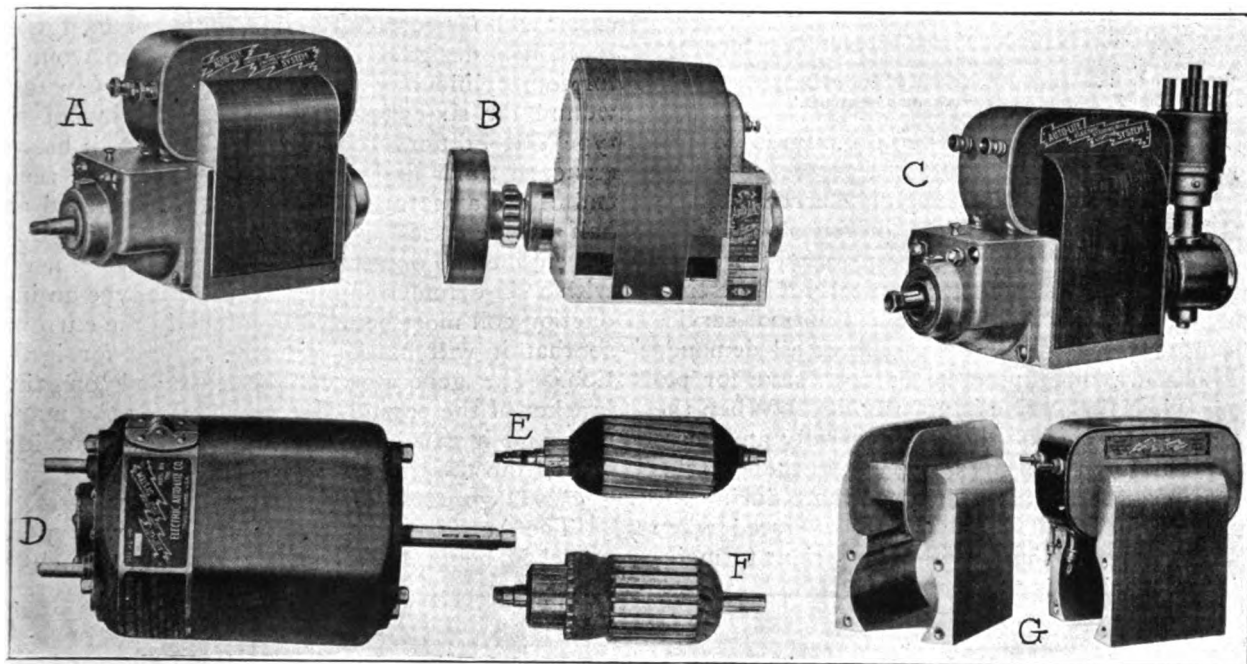
ator is very compact and it much resembles a magneto in general appearance. The armature is mounted low in the machine to bring it between the poles of the magnets. The speed is approximately two and a half times the speed of the crankshaft of the engine. The drive is by a silent chain or by gearing from crankshaft or any other shaft having the same speed.

Mechanical Centrifugal Governor.

The control of this machine is by connecting the armature shaft indirectly through a friction clutch, the clutching members being held by the pressure of springs that are controlled by the centrifugal force produced by the revolution of two swinging arms. When the speed of the armature has reached approximately 1850 revo-

tended solely for battery charging.

The other type of generator is known as model G, which differs from the machine just described in that it is a self-excited type. With this the fields are wound, a compound construction, the field current for excitation being drawn from the armature. The armature is built with the coil channels not in parallelism with the shaft, or slightly helical in arrangement, this construction being designed to avoid heating and insure against creation of noise. The self-excitation obviates the use of a governor, for the regulation of the machine is accomplished through the use of a reversed series winding, this winding being so designed that the strength of the magnetic fields cannot be increased beyond a

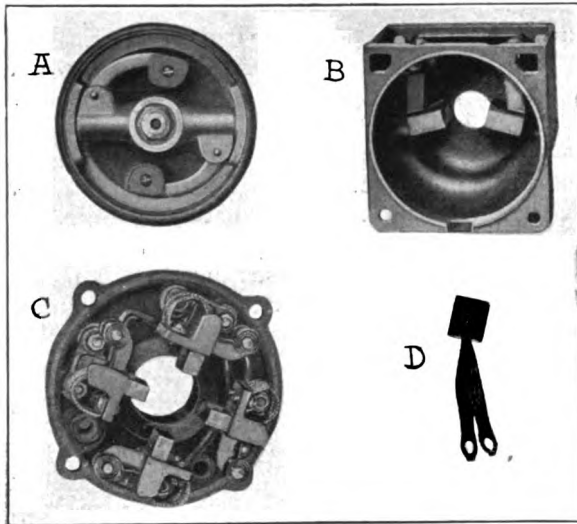


Generators and Motors: A, Type SR4 Generator; B, Type C-60 Generator; C, Type VR4 Generator; D, Model M Motor; E, Generator Armature; F, Motor Armature; G, Laminated Fields of the G Type Generator.

lutions a minute the pressure or force of the swinging arms compress the springs that up to that speed retain the clutch, and as these springs are compressed the sprocket, which is driven by the engine, will revolve independent of the shaft. At this point the current production of the generator is six volts at a pressure of 12 amperes, which is sufficient to light all the lamps and to charge the battery. With this means of regulation the speed of the generator armature is never in excess of 1850 revolutions a minute, which will afford the maximum current production. The statement is made that the action of this governor is absolutely automatic and that it never requires attention or care. This generator is in-

certain point, no matter what the speed of the machine, the current opposes itself so that the field strength is balanced.

With the centrifugal governor the generator will begin to produce current and charge the battery when the vehicle speed is about five miles an hour, and this production will increase until the car has reached a speed of $17\frac{1}{2}$ miles an hour, when the governor will become operative and no greater amperage will be generated. With the second type the generator will begin current production when the machine is driven to what corresponds to six miles an hour vehicle speed, and it will increase to a maximum at approximately 18 miles an hour. The greatest current obtained



Constructional Details: A, Centrifugal Type of Mechanical Governor; B, Commutator Housing of the Model G Generator; C, Head Plate of Motor, Showing the Brushes; D, Brush and Pigtail.

is about 12 amperes, and the minimum is six amperes.

No Excess of Charging Current.

As a car is very seldom driven slower than the speeds at which the generators will produce current, energy is created practically all the time the vehicles are in service, and in normal service the production is sufficient to meet all demands without drawing upon the battery, save for periods when the engine is not running. When the lights are not in use there is generally an excess that is charged into the battery. As the expectation is that the cars will be used more during the day than at night, the current generated when the lights are not used will be sufficient to maintain a sufficient battery charge.

Theoretically a battery should be completely charged and discharged, and at a normal rate, and the intention is that the charging shall never be an excessive rate, and during the hours of daylight the only consumption of current will be for starting, which ought to be but a small part of what is generated, while at night the production will be sufficient for all lights and cause no heavy drain upon the battery. Thus the discharge during day driving will be for starting and all excess shall be stored, while at night the discharge will be during the period when the engine is not

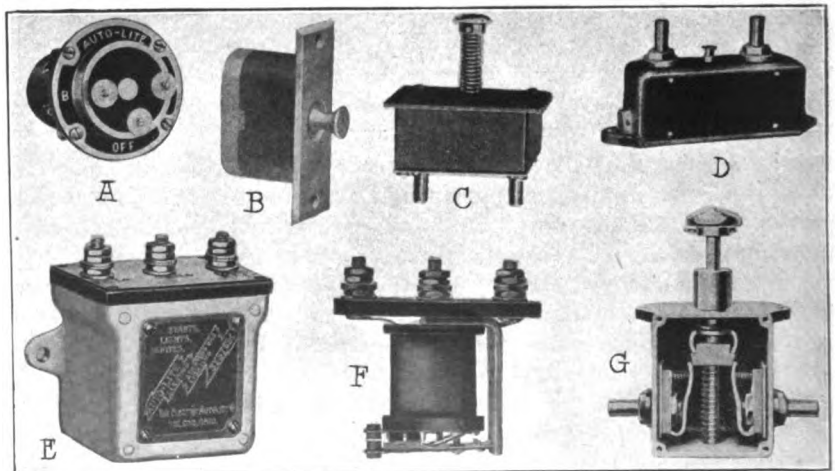
running and the lights are in use. The current required for lighting when the car is idle is minimized by dimming the lamps.

The Methods of Driving.

The electrically regulated generator is designed to be driven at engine speed, and it will generate current when turned 200 revolutions a minute. It is practical to install it on a bracket at the side of the engine and drive it with the same shaft that would be used to drive the magneto, for it requires no more space than an ordinary magneto, and it may be either coupled with a magneto in line by an Oldham coupling or driven separately. One model G generator is known as type S R 4; it weighs $37\frac{1}{2}$ pounds and is 10 inches length and $4\frac{3}{8}$ inches width. When the machine is built with the shaft extended at either end, for coupling in line, with a side engine shaft, it is designed as type D R 4 when wound for four-cylinder engines and type D R 6 when wound for six-cylinder engines. The model G type V R 4 differs from the others in that it has a standard timer and distributor built on the rear end of the armature shaft, which are operated at half engine speed when used with a four-cylinder engine and one-third engine speed when used with a six-cylinder engine. With this type an induction coil must be used to intensify the current so that it will have sufficient voltage for ignition. The generator can be installed on the bracket of the engine case intended for the magneto and it can be driven by the usual outside shaft from the timing gearset.

Two Auto-Lite Starting Motors.

The Auto-Lite motors are made in two types, model M being $8\frac{3}{4}$ inches length and $5\frac{1}{2}$ inches



Control and Regulating Members: A, Auto-Lite Coll; B, Single Type Lighting Switch; C, Starting Switch for Footboard Installation; D, Starting Switch Used with Flywheel Motor Coupling; E, Auto-Lite Circuit Breaker; F, Circuit Breaker Coll; G, Gross Section Footboard Type Starting Switch.

width, and model M C is $7\frac{1}{2}$ inches length and $6\frac{3}{4}$ inches width, the former weighing $36\frac{1}{2}$ pounds and the latter 30 pounds. They are similar in general appearance, both having octagonal frames of cast iron in which they are completely enclosed to protect them against dust and water, and yet are so constructed that the brushes and commutators are easily accessible. The name plate of the model M serves as a cover, by removing this one having access to the machine for inspection or work.

The octagon shape is regarded as being advantageous for installation, the machine being firm whenever set on its side, and it may be placed in comparatively small space. The motor is constructed, however, so that it may be installed in a vertical position, and it can be set upright beside an engine and driven by a chain and gears, or it may be mounted on top of the transmission gearset case and the drive may be through a worm and gear wheel. When placed horizontally it usually drives through the timing gearset or through an external ring gear on the rim of the fly-wheel.

Series Wound Six-Volt Motor.

The motors are a series wound type that are driven with a pressure of six volts, which will draw approximately 95 amperes when affording maximum power, and will turn the engine 100 revolutions a minute for starting purposes. This is regarded as being sufficient for all normal requirements. These motors have cast iron frames and fields and have four poles. The M C type has extra large bearings. As the motors have very liberal annular ball bearings, and they are only used for starting, the wear is comparatively small. The armatures are bar wound on nickel steel shafts and are intended to be very enduring.

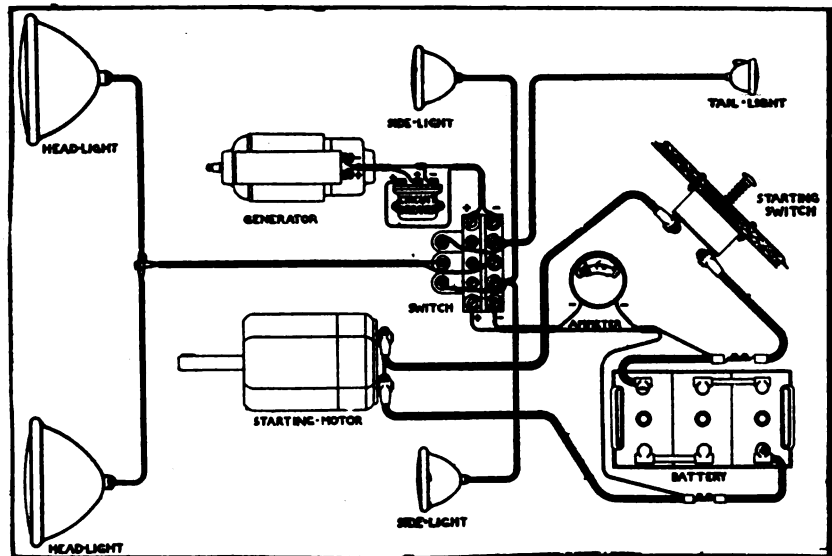
When the motors are installed to drive at the flywheels the coupling is usually made by a pinion sliding on a squared countershaft that meshes with the flywheel external ring gear, this shaft being driven by silent chain from the sprocket on the driving end of the motor shaft. Or in other installations the coupling is by a weighted pinion on a worm cut on the shaft driven by the motor, this being what is known

as the Bendix type of drive. This is also used when the motors are mounted on the covers of the transmission gearset cases.

Over-Running Type of Clutch.

When the motors are installed at the forward ends of the engines and the coupling is by a chain, an over-running clutch is fitted in the sprocket of the crankshafts. This consists of a central member that is keyed to the engine shaft, three rolls and the sprocket ring, with suitable means for retaining the rolls in the clutch. The clutch is automatic and extremely efficient. It is built entirely of heat treated nickel steel and is very enduring. It requires no attention other than occasional lubrication.

The batteries are the LBA lead-acid type, rated at six volts and 120 amperes capacity. These



Wiring Diagram of Typical Auto-Lite Starting and Lighting System, Showing Connections, but Not Drawn to Scale.

are located usually in boxes carried on the running boards for protection and accessibility. At the normal rate of discharge these batteries ought to afford current of one ampere for 120 hours. But if the discharge rate is hastened the capacity is lessened, usually nearly 50 per cent. of the capacity being lost when a battery with a normal discharge rate of eight hours is discharged in one hour. With all the lights on the current required would be from 10 to 15 amperes, and this size battery would give 15 amperes for eight hours if fully charged. It will be seen that its proportions are much in excess of what would ordinarily be needed for car operation.

Starting and Lighting Switches.

The system includes a reverse current relay or circuit breaker which is an electromagnetic

switch that is set to close the circuit when the engine speed is equivalent to $5\frac{1}{2}$ or six miles an hour, and which will open the circuit when the engine speed is equivalent to four or five miles an hour, this being intended to insure against the continuous opening and closing, which would result if the device were to open and close at a single point. This design obviates all complications.

The starting switch is usually placed under the floor of the driver's compartment, this being operated by a conveniently located heel button. These are of different types to meet the needs of the installation and sometimes are used on or near the starting motor, such linkage as is necessary being supplied to make the necessary coupling between the foot button and the switch itself.

The lighting is controlled by a gang push button switch installed in the instrument board where it may be conveniently reached from the driver's seat. The coil used with the timer and distributor is a type that is conventional, having the soft iron wire core and the primary and secondary windings. The primary winding, which is connected with the circuit breaker, and is in series with the battery, carries but six volts, but this is intensified in the secondary winding to about 20,000 volts, at which potential it is sent to the spark plugs by the distributor. The coil is constructed so that it cannot be burned, a thermostat throwing it off should the driver neglect to do so.

The company also builds a generator that may be driven by chain, train of gears or V belt, which is driven at $2\frac{1}{2}$ times engine speed and has a maximum current production of 14 amperes, generation beginning at a speed equivalent to about seven miles vehicle speed and producing 10 amperes at about 12 miles an hour. This generator is regulated by a reversed series coil. The case is cast iron, this completely enclosing the armature, easily removable side plates affording access to the machine. The armature is mounted on very large annular ball bearings and the commutator and brushes are of unusual size to insure good contact and prevent sparking at the brushes. These generators are not adapted for use with ignition equipment.

PIKES PEAK HILL CLIMB.

A hill climbing contest up the new Pikes Peak highway, from Cascade to the summit, 17 miles, will be held next year if present plans mature. The contest will be arranged so that trucks and

all types of passenger cars may enter. The trucks will go up under full load. The altitude at the bottom of the climb is 6000 feet and at the top 14,000 feet, so that the rise is about 8000 feet. The route is extremely novel and interesting. When the lower portion of the road was opened as far as Glen Cove on Sept. 1, the J. C. Wilson Company's worm drive truck made the climb on several occasions with a two-ton load and will probably compete next year.

MASSACHUSETTS REGISTRATIONS.

Automobile registrations in Massachusetts already exceed the entire year of 1914 by 25 per cent. and are rapidly approaching the 100,000 mark. In September 3434 licenses were issued, as compared with 2149 last year. The total number of registrations has now reached 96,592, which is an increase of 31 per cent. over the same period in 1914 and the amount of fees taken by the commission is given as 29 per cent. greater. The growth of the registration in the state is shown in the following table of registrations for the first nine months of three recent years:

	1915	1914	1913
Automobiles	*96,592	†73,765	61,062
Motorcycles	9,195	7,875	6,839
Manufacturers or dealers...	1,711	1,501	1,305
Licenses (operators and chauffeurs)	39,074	23,492	19,865
Operator and chauffeur renewals	80,126	65,643	53,409
Total receipts	\$1,159,976	\$897,994	\$737,864

*Includes 11,150 commercial cars. †Includes 7813 commercial vehicles.

TO RENT CARS IN CALIFORNIA.

A company has been formed in California with the idea of renting motor cars to those who cannot afford to own them on the same basis that the old time livery man used to rent his rigs. An association will be formed to which persons of good reputation and standing will be admitted on the posting of a deposit to cover repairs made necessary by accidents or unexpected happenings to the car while it is out on rental. Members who do not know how to drive will be taught. Members will be entitled to take out a car for a few hours a day or several days, just as though they owned it. In this way it is believed that the pleasures of motoring can be extended to many persons who have not the money to own one or to pay upkeep on it. The men behind the company are A. L. Whitmer and W. H. Wright. The cars will be new and completely equipped 1916 models.

SPECIAL CONVERTIBLE TOURING SEDAN.

ADAPTATION of motor vehicle body design to meet specific requirements and yet preserve the essential characteristics of approved types without approaching freakishness is both an art and a science. One may create what is novel enough at the expense of convention, but to develop what will have every desired convenience and utility within the very limited passenger space of a normally proportioned car, and yet preserve its internal and external appearance, is an undertaking that more often results in failure than a practical accomplishment.

A development of more than ordinary interest is a body that has for the purposes of description been given the name of a convertible touring sedan, which has been installed on a White 45-horsepower, four-cylinder chassis, and was built by J. Frank Cutter, a well known coach body designer of Cambridge, Mass., to meet the ideas of Capt. Ferdinand de Jony of Bellingham, Mass., who is now en route across the continent in it.

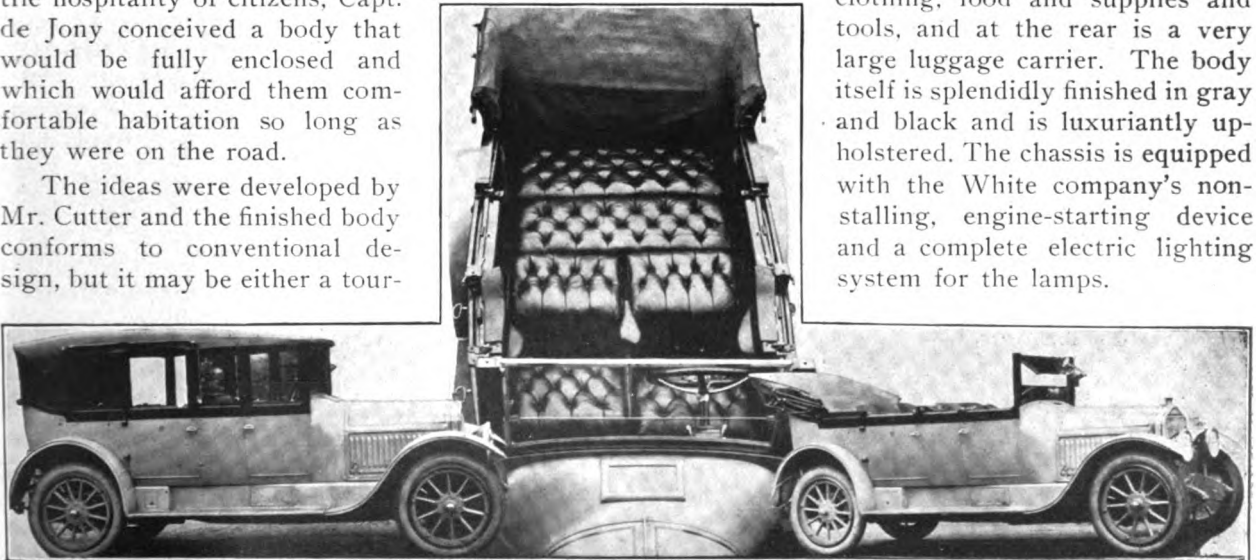
Capt. de Jony is a retired Austrian army officer and Mrs. de Jony is a native of California. Both are enthusiastic motorists and they decided to drive across the continent in the autumn, to visit the Panama-Pacific Exposition at San Francisco, and then pass the winter in California. Because they desired to have such protection that they could drive in practically any weather, and in the event of need be independent of hotels or the hospitality of citizens, Capt. de Jony conceived a body that would be fully enclosed and which would afford them comfortable habitation so long as they were on the road.

The ideas were developed by Mr. Cutter and the finished body conforms to conventional design, but it may be either a tour-

ing car or fully enclosed, and the interior is so built that it may at night be converted into a sleeping compartment that insures extreme comfort. The body is shown in the accompanying illustrations with the folding top raised and lowered, and with the seats arranged for sleeping. The top is rather low and the sides of the body are somewhat higher than usual. The bonnet of the top extends forward over the permanent windshield. The four windows on either side drop into pockets in the doors and in the body sides, while the metal frames for the windows fold and are concealed by leather flaps that button flat. The windows are also fitted with metal screens for protection against insects and intrusion, and they are fully curtained.

The front seat is divided, that used for driving being adjustable to afford change and freedom of position, and the seats are built so that the backs may be lowered and the seat cushions adjusted, much the same as those of a Pullman sleeping car, so they form a bed ample for two. There is a folding table for use in the space between the seats, and two folding removable chairs for use at the table, for four persons can be seated at a meal.

The closed body is equipped with a ventilator in the cowl of the dash, and it is heated from the exhaust. The doors may be locked from within or without. There is abundant storage space for clothing, food and supplies and tools, and at the rear is a very large luggage carrier. The body itself is splendidly finished in gray and black and is luxuriantly upholstered. The chassis is equipped with the White company's non-stalling, engine-starting device and a complete electric lighting system for the lamps.



The Convertible Touring Sedan Body on a White 45-Horsepower Chassis in Which Capt. and Mrs. Ferdinand de Jony of Bellingham, Mass., Are Making a Transcontinental Tour—The Top Raised, the Seats Arranged for Sleeping and the Top Lowered.

GENERAL NEWS OF THE INDUSTRY.

Chevrolet Motor Company of Delaware Incorporated for \$20,000,000—\$1,000,000 Profits for International—Packard to Earn \$16,000,000—Personal News.

ONE of the biggest of the financial deals of the season, and one fraught with much general significance, is the incorporation of the Chevrolet Motor Company of Delaware, a holding company with a capitalization of \$20,000,000. One of the significant facts disclosed in the announcement is that the officials are planning assembly plants at various strategic points in the country, after the fashion of the Ford Motor Company. Another fact, which is indicative of the stability and future of the automobile industry, is that the huge block of stock not only was snapped up within a few hours after it had been offered at private sale, but that the issue was oversubscribed many times. Offered at 85, the stock quickly climbed on the New York curb to 114.

The chief spirit in the organization is W. C. Durant, founder of the Chevrolet Motor Company, Detroit, and now vice president of the General Motors Company. He is president of the new corporation and will control the company, with his present associates, entirely aside from the affairs of the General Motors Company, according to a statement attributed to General Manager A. B. C. Hardy.

The constituent companies will operate plants at Tarrytown, New York City, Flint, Mich.; Toronto, Oakland, Cal., and St. Louis. The Chevrolet cars will continue to be made at the main plant at Flint, but the 1917 models may be turned out principally from the assembling plants. Of the latter those of New York City, Tarrytown and Toronto are already in operation, making up cars in addition to making parts. The Oakland company is soon to be started, and the one at St. Louis has been incorporated for \$1,000,000. R. E. Gardner, owner of the Banner Buggy Company, is deeply interested in the St. Louis company, and it is planned to turn his plant into an automobile factory as soon as possible. It is expected that 500 men will be employed and the production will be about 25,000 cars a year. This plant and that in Oakland will do assembly work only.

In disposing of the stock of the holding company, the owners of the old Chevrolet stock took

up \$13,500,000 of the new stock, while the balance went to large investors. The balance sheet of the company, as of Aug. 14, 1915, after the introduction of the funds raised by new financing, is expected to be approximately as follows:

ASSETS.	
Cash	\$5,346,111
Accounts and notes receivable, less reserves..	359,992
Inventories of finished cars, merchandise on hand and in transit, and work in process..	1,475,394
Investments	748,500
Total current and working assets.....	\$7,929,998
Deferred charges	69,438
Real estate, patent rights, good will.....	13,237,242
Total	\$21,236,679
LIABILITIES.	
Accounts payable and accrued liabilities.....	\$1,141,679
Mortgage	95,000
Capital stock	20,000,000
Total	\$21,236,679

The Chevrolet Motor Company was organized in November, 1911, in Detroit, its capital stock being \$2,500,000. About a year later the Little Motor Car Company, at Flint, was absorbed, and the Chevrolet company moved into the plant. From a production of 550 cars in Detroit the number of cars made jumped to 3500 in the first year at Flint, and in the second year to approximately 7000.

The output schedule for the Chevrolet Four-Ninety for 1916 calls for 60,000 cars, but plans have already been laid for 200,000 cars of that model for 1917. One immediate provision for this increase is the acquisition of a new assembling plant that will employ at least 1000 men. The plants of the Mason Motor Company and of the Walker-Weiss Axle Company, both of Flint, and where motors and axles are made for Chevrolet cars, will be greatly enlarged and production will practically be doubled.

INTERNATIONAL PROFITS \$1,000,000.

The International Motor Company will have earned, it is understood, net profits for the calendar year of 1915 of approximately \$1,000,000, which is equal to 28 per cent. on the \$3,600,000 preferred stock outstanding. This period includes the very poor results of the first quarter of the

year, as it was not until about March that the turn for the better in the company's business was noticeable.

Since that time profits have been running at record figures, through war orders and big domestic business. Demand for Saurer and Mack trucks, which the company manufactures, has in recent months run ahead of production, and certain departments have been working day and night.

The high record of profits for a month was \$125,000, which is at the rate of \$1,500,000 per annum, or 42 per cent. on the preferred stock. The preferred has paid no dividends since the fall of 1912, and the rate is seven per cent. cumulative. There is outstanding \$5,628,125 common stock, on which no dividends have ever been paid.

PACKARD'S IMMENSE BUSINESS.

The Packard Motor Car Company, Detroit, Mich., is expected to report gross receipts for the fiscal year ending Aug. 31 of nearly \$16,000,000, which is a gain of about \$3,000,000 over the previous year. This represents an increase of approximately 23 per cent.

The interesting feature of the gain, however, is its source. The company actually sold and delivered but 1800 pleasure vehicles, as against sales of the same class of 2625 the year before, and 2983 in 1913. In other words, the sale of pleasure cars fell off 30 per cent., but the gross gained 23 per cent. From this the inference is taken that it was war orders, plus a good domestic business in trucks, which enabled the Packard company to make the excellent showing it has made during the past manufacturing season.

NEW MANAGEMENT FOR PATHFINDER.

Management of the affairs of the Pathfinder company of Indianapolis has been vested in an executive committee consisting of C. J. Root, Crawford Fairbanks, W. K. Bromley, W. E. Stalnaker and W. C. Toasdale, Jr. Stalnaker is vice president and general sales manager and has been elected to the board of directors, as has George H. Mosher. Karl Feilcke is also one of the directors.

INCORPORATES FOR \$100,000.

The Fostoria Light Car Company, Fostoria, O., which manufactures four types of cars—a

roadster, a five-passenger touring model, a coupe and a light delivery—is being incorporated with a capital of \$100,000. The incorporators are: J. H. Jones, president; Ira Cadwallader, vice president; Charles Ash, secretary and treasurer; A. O. George, factory manager. The company is now ready to make immediate deliveries on all four models.

AJAX PAYS DIVIDENDS.

Following the annual meeting of stockholders of the Ajax-Grieb Rubber Company, Inc., Trenton, N. J., Horace De Lisser, chairman of the board of directors, made public announcement of the payment of seven per cent. on the preferred stock and 24 per cent. on the common. He also

announced that an important amount was carried to the surplus account and that the company was planning for a new three-story factory, 200 by 350 feet, containing 210,000 square feet of floor space. The foundations will be so constructed that three additional stories can be



Horace De Lisser of Ajax Grieb Rubber Company.

added later. The extensions also include a new power house, engine, dynamo and boiler units.

Mr. De Lisser said that the company has never been able to build enough Ajax tires to meet the demand, though new additions have been made each season, and it has been forced to operate continuously in three shifts 24 hours daily since February, 1911.

BARNES LEAVES OVERLAND.

Claire L. Barnes, who joined the Willys-Overland Company in January, 1914, as special assistant to John N. Willys, has resigned, to take effect the first of the year. At the time he joined the company he was head of the Claire L. Barnes

Company, manufacturers' selling agent, with offices in Detroit, Cleveland and Chicago. It is understood that he intends to return to that business.

COLE ADDS ANOTHER ENGINEER.

The latest addition to the engineering staff of the Cole Motor Car Company, as announced by President J. J. Cole, is M. B. Morgan of Detroit. For the present he will be stationed at Detroit with Chief Engineer Crawford, but later will go to Indianapolis with the other members of the staff.

Officially he will be known as the production engineer and he will give personal attention to every feature of the cars as they are turned out.

Part of his work will consist of inspecting the parts and accessories made outside of the Cole plant.

Mr. Morgan leaves the position of chief of inspection for the Chalmers company. He has had wide experience with several of the larger automobile companies

in this country, chiefly in

the engineering departments, some of his connections including the Oldsmobile, Marion and Chalmers companies of which he was the chief engineer at varying different times. One of his earlier connections was with the Packard company, he being in the drafting department when that company was turning out its model S cars.

While connected with the Peerless company Mr. Morgan laid out the first underslung racing car built in this country. It was the famous Green Dragon which Barney Oldfield drove in the early days.

DODGES SELL FORD STOCK.

John F. and Horace E. Dodge, who comprise the firm of Dodge Brothers, manufacturer of

cars of that name, have sold out their holdings of 10 per cent. of the stock of the Ford Motor Company of Canada, which they received on the organization of that company in 1906. They are reported to have received \$828,750 for their 510 shares of stock, which gives a rate of \$1625 a share. This is indicative of the great value in which that stock is held. The Canadian company last year earned approximately \$2,000,000 on \$1,000,000. It is understood that Dodge Brothers will establish a plant of its own in Canada in the near future.

FOSS IS COMMERCIAL MANAGER.

W. J. Foss, who for 10 years has been a distributor of Pierce-Arrow cars, has been appointed commercial manager of the Pierce-Arrow Motor Car Company and will have entire charge of the marketing of the company's product, including service and advertising.

Foss originally was in the bicycle business in Providence, R. I. In 1897 he went to Washington as branch manager for the Pope company. In 1905 he went to Boston and the same year moved to Philadelphia, where with A. E. Hughes he formed the Foss-Hughes Company.

That company is now Pierce-Arrow distributor in Philadelphia, Providence, Newport, Baltimore, Washington and Wilmington. Mr. Foss showed conspicuous ability in building up this great business, not only in selling cars, but in keeping customers satisfied and holding them.

INNESS SUCCEEDS PORTER.

J. A. Innes, formerly manager of the Philadelphia branch of the Chase Motor Truck Company of Syracuse, N. Y., succeeded F. B. Porter as manager of the Chase New York branch on Oct. 1. Mr. Porter, who has been New York manager for Chase for the past nine years, left to take up another line of work. C. E. Collard, formerly with the New York Chase organization, takes Mr. Inness' place at Philadelphia.

WILLIAMS RETURNS TO OVERLAND.

Ralph T. Williams, who has an extensive acquaintance in the automobile trade, has returned to this country from his work with the Willys-Overland, Ltd., of London, England, to take the place vacated by the resignation of Juan T. Yrigoyen, assistant manager of the foreign department at the Toledo factory.



M. B. Morgan, Production Engineer, Cole Company.

HOLTON MANAGES FARMACK SALES.

Hoover Holton, formerly associated with the American Motors, the Empire Automobile and the Briggs-Detroit companies, has joined the Farmack Motor Car Corporation, Chicago, as general sales manager. His chief duties at present will be to organize the sales department for the distribution of the Farmack touring and roadster models, which sell at \$855. Mr. Holton has travelled through every state in the Union, and has handled sales in even the remote sections of the world.

GRAY RESIGNS FROM GRAY & DAVIS.

William H. Gray, general manager of Gray & Davis, has resigned his position. He is not William Gray, the president of the company. Some of the firm's machinery is available for outside work and an order for munitions from a foreign government has been accepted. Alexander Churchward remains as engineer.

KELLEY REJOINS MAXWELL.

William Kelley, well known as a pioneer automobile engineer, has rejoined the Maxwell Motor Company's staff as consulting engineer, with special duties in adapting car design to manufacturing facilities. The appointment was announced by Ray Harroun, chief engineer for Maxwell.

MERINBAUM JOINS SUN COMPANY.

S. A. Merinbaum, who has been identified with the Haynes Automobile Company for a number of years in the capacities of advertising manager and sales promotion manager, has joined the executive staff of the Sun Motor Car Company, Buffalo, N. Y.

STUDEBAKER DEMAND INCREASES.

Although at the time it disclosed its new models the Studebaker Corporation announced that it was planning on a production of 60,000 cars for the coming year, allotments made to dealers up to this time total 76,000 cars and production has been increased to the point where it is taking care of the additional 16,000 cars. Of this number 70,000 are said to be for domestic use and 6000 for export. The Studebaker export department is making shipments to Canada, Great Britain, Australia, India, China, Philip-

ines, South Africa, South America, Cuba, Porto Rico, Central America and continental Europe.

C. F. LOTT PROMOTED.

Charles F. Lott, for 15 years private secretary to Hugh Chalmers, was elected secretary of the Chalmers Motor Company at a meeting of the directors recently held in Detroit. Secretarial duties were previously performed by C. A. Pfeiffer, vice president and general manager.

WILLYS HAS SHIPPED 50,000 CARS.

Since the new models of the Overland for 1916 began to be shipped in April the Willys-Overland Company, Toledo, has sent out 49,977

cars and production has grown so that regular shipments are going forward at the rate of more than 500 a day. On the record day of September 627 cars were shipped.

For the same period last year 21,426 cars were shipped. This was regarded as a remarkable record at the time, but this year's shipments are greater by 133 per cent. The great additions to the factory have expanded it from 60 acres of floor space at the beginning of the year to 103 acres. It is now the largest plant in the world devoted exclusively to the manufacture of automobiles.



Hoover Holton, General Sales Manager, Farmack Corporation.

OLWELL TO LEAVE CHALMERS.

Lee Olwell, commercial manager of Chalmers Motor Company, will leave that company Nov. 1. For three years before going to Detroit he had been advertising director for the National Cash Register Company. It is understood he will enter business in New York.

WIDER FABRICS CHEAPEN TIRES.

TIRE fabrics are being made by the New England textile mills in greater widths than formerly. Originally tire fabrics were sold quite generally in 42-inch widths. Later the demand required cloth 48 inches wide, and recently most of the larger tire companies have demanded a fabric 60 inches wide. There is now some talk of extending the width to 90 inches. None of that width is now being made, but it probably will be as soon as suitable looms and tire making machinery can be built.

The reason for this is one of economy. A 60 or 90-inch loom can be operated as fast as a narrower one and a single operative can care for about the same number of looms. This increases the daily production almost in ratio with the increase in width without adding appreciably to the operating expense.

In the tire factories the fabric is callendered to dry it out thoroughly and is then run through another machine, where it is impregnated with rubber. The same economies are affected here as in the textile mills—one operation directed at the same speed by the same amount of labor preparing twice as much fabric of 90-inch width as of 45-inch.



Harry F. Grant, Famous Auto Racer, Who Succumbed to Injuries.

Sixty-inch fabrics are used exclusively by Firestone, Goodyear and the U. S. Tire companies. The smaller companies, who do not always have the capital to change their machinery, are still using largely 48-inch widths. The textile manufacturers are able to sell the wider fabric at a lower price per pound and still make more profit, and the same is true of the tire makers.

GRANT DIES OF BURNS.

Harry F. Grant, twice winner of the Vanderbilt cup race and one of the foremost of American automobile drivers, died Oct. 7 of burns received 10 days before while trying out his Maxwell car at the Sheepshead Bay speedway. Though the injuries were considered severe, it

was reported that he would recover in time to enter racing events this fall. His death came almost unexpectedly and cast a shadow over the Astor Cup race event held two days later.

The accident was due to the breaking of the gasoline line while his car was going more than 90 miles an hour and travelling along a high banked turn. The flames enveloped him, but he continued on, knowing that to stop the machine on the bank would result in it turning over and probably crushing his mechanic and himself. Grant sustained burns from the waist down and suffered intensely. The mechanic was uninjured.

Grant's racing career began in 1907, and was brilliant and singularly free from accidents. Last fall at Corona occurred an accident almost similar to that which resulted in his death. The car turned over and burst into flames, but Grant escaped unhurt.

Harry Grant was born in Cambridge, Mass., in 1877. Entering the automobile industry as salesman and demonstrator in the Boston offices of the Alco Company of Providence, he became interested in road racing. He is well remembered as having won two consecutive contests in the Vanderbilt Cup race, in 1909 and 1910, on Long Island. Grant was married and his widow survives him.

U. S. LIGHT CONVENTION.

The annual convention of the United States Light and Heating Company assembled Oct. 12, at Niagara Falls, N. Y., the convention to last to the 15th. Dispatches relate that salesmen and branch managers from all sections of the country were in attendance at the daily business meetings. The list of speakers include J. Allen Smith, president; Harry Ackerman, general manager, and C. C. Bradford, sales manager.

CARRIAGE MEN WANT LIGHTS.

The Carriage Builders' National Association passed resolutions at their Cleveland convention favoring legislation which would require that all vehicles be fitted with both front and rear lights. They also demanded that all roads built in the future should be wide enough so that a horse drawn vehicle could safely pass an automobile. Cincinnati was chosen as the meeting place for 1916.

PSYCHOLOGICAL TESTS FOR DRIVERS.

THE New York Medical Record urges the legislature to provide that no license shall be issued to an automobile driver until he has proven his psychological fitness, as well as his knowledge of the car and how to run it.

The psychological unfitness of many drivers is shown by the fact that many accidents befall the same man. It would be possible in the laboratory to determine the reaction time of any individual, which would indicate his alertness and the quickness with which he can respond to danger. If he is slow and acts incorrectly his unfitness would be proved.

The fact that a large proportion of the automobile accidents occur after dining out is cited to show the effect of alcohol of removing the restraining impulses of the sober mind even when it has not been taken in sufficient quantity to really intoxicate.

SCHOOL FOR EMPLOYEES.

The Studebaker Corporation has announced a school for young employees in its South Bend plants. There will be two courses, one for office work and one for mechanical work. Students must be under 17 for the office course and under 20 for the apprentice course. The course will be carried on for three years and for each week 50 cents will be deducted from the wages of the student as a guarantee that he will continue the work and remain at his employment. In case he leaves for any other reason, except sickness or is discharged, the company keeps the money. If he completes the course satisfactorily it is returned to him, with interest equal to that given by savings banks. The company pays for the student's membership in the Y. M. C. A. and the course is given by that organization.

GRAPHITE IN CYLINDER OIL.

The use of about one teaspoonful of finely ground graphite of the highest quality in cylinder oil is recommended by A. G. Seiberling, general manager of the Haynes Automobile Company, Kokomo, Ind. This fills up the minute pores in the metal and will gradually cover the surfaces with a material that heat can destroy only with great difficulty. Great care must be used in getting the best graphite. In winter it should be

used in connection with light cylinder oil and in summer with that of a medium grade.

THE SUBMARINE OF MOTORDOM.

Reasonably deep rivers do not stop the progress of the National Highway Twelve, as was shown in a recent test, which is depicted in the accompanying illustration, conducted at the base of Wildcat mountain, in eastern Tennessee. Though the water at times covered the wheels



Fording a River in Eastern Tennessee in a National Highway Twelve.

and was about five inches deep in the tonneau, the 12-cylinder motor continued to operate smoothly. The company states that this is possible because of the construction of the motor, in which two blocks of six cylinders each are placed in V shape and in this V are located the carburetor and magneto, the two units that are so quickly effected by water. During the test the electric starter operated perfectly, even though the battery was entirely submerged.

In September 43 persons were killed by automobiles in New York City. The trolleys killed five and horse drawn vehicles nine.

THE SOLUTION OF ONE JITNEY PROBLEM.

Providence Company Operates Fleet of Seven-Passenger Cadillacs, with Neatly Uniformed Drivers to Neighboring Pawtucket.

AN EXPERIMENT in operating an extensive jitney service on a thoroughly organized and businesslike plan has been underway in Providence, R. I., for five weeks, with results that convince the company that there is money in the business and assurance of a profitable future. Six seven-passenger Cadillac cars, equal in every way to the best taxi cabs, have been in use in this service and eight more are being prepared in the shops for installation.

Many operators of jitney services who have failed and gone out of business are watching this service very closely. It will attract a great deal

best and most courteous service to its patrons. Few taxi cab companies charging much higher rates lay more stress on that purpose or accomplish it more fully.

Both Providence and Pawtucket have been highly jitneyized cities since the movement first hit the East early last spring. About 1200 jitneys were licensed and operating in Providence at one time, and there were several hundred in Pawtucket. Most of these were Ford cars, or many year-old models of other makes and in the worst condition.

The jitney operators did very well when the business was a novelty, but the great number that entered it and the preference of many people for street cars as compared to poorly kept, rattling and often recklessly driven motor cars, began to effect its prosperity and a large number went out of the business. Then Providence passed an ordinance calling for a \$500 bond for each seat used and for a comparatively high license. Many found it impossible to secure the bond and dropped out, but there were still a great many in operation—all there seemed to be steady patronage for.

When the jitney business first began in Rhode Island the Metropolitan Rapid Transit Company was organized. It bought three Federal truck chassis with 22-passenger bodies and began operating them at a five-cent fare on a regular schedule between Providence and Pawtucket, R. I., a distance of 4 $\frac{3}{5}$ miles.

Even before that the men who formed the company had operated motor trucks in the commercial trucking field. They already had a service station, garage and mechanics, as well as experience with motor vehicles. The establishment of the 'bus line they regarded as an extension of their freight business—though the freight in this instance was human.

These passenger 'buses were operated in two-



A Metropolitan Rapid Transit 'Bus on a Federal Truck Chassis, Operated in Street Car 'Bus Service to Pawtucket, R. I., from Providence.

of attention from automobile trade interests and from street railway men as well.

The route over which these cars are run is from Providence to Pawtucket, R. I., a distance of a little more than four miles, and the fare collected is 10 cents a passenger. The cars are operated from 5:30 in the morning until 1:30 the following morning, and each makes a daily mileage of approximately 200 miles.

Drivers, as well as the starters who direct the service from Exchange place in Providence, are uniformed in neat letter carrier gray uniforms. The cars are kept scrupulously clean. The whole attitude of the company is one of providing the

shifts, from 5:30 in the morning to 1:30 at night, and in competition with trolley cars on a regular schedule. The novelty attracted many more people than the 'buses could carry. Then the business fell off heavily, only to revive gradually, and it has been handled at a good profit since.

The company found that the enlargement of its operations by the addition of the three 'buses gave it some large scale advantages which made it possible to do all of its motor hauling business cheaper. More gasoline was used and at a better price. The same was true of its tires, oil and other supplies. The advertising privilege in the 'buses brought in a considerable revenue. The cost of its service station and office overhead was spread over a greater volume.

Experiments to cut operation costs to the minimum were tried. Various makes of tires, oil and gasoline were tested, minutely accurate records of performance were kept, and the company succeeded in cutting its original costs very materially.

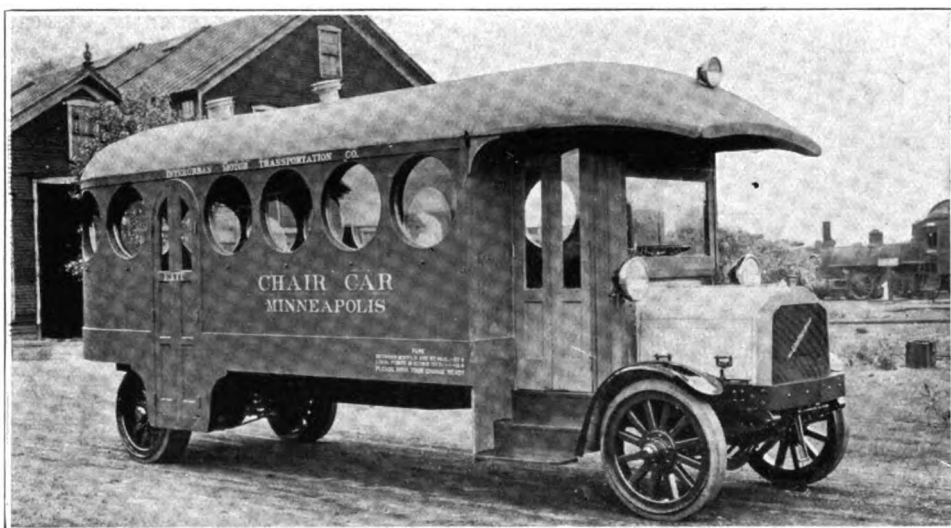
Therefore, at a time when it had been demonstrated that there was a real demand for transportation units of the passenger car type, but when many individual operators were pulling out of the business because of losses sustained, the promoters felt confident that their better organization and better knowledge would enable them to succeed with a jitney service de luxe.

Although the street cars get only five cents for the run from Providence to Pawtucket, the jitneys had from the first been able to charge 10 cents. This was because they operated substantially an express service, making the distance in 15 minutes as compared with 30 or 35 for the trolleys, and because many people preferred the comfort of a touring car to the trolley.

It was felt that success demanded that this speed be kept up. The 'bus service to Pawtucket makes about the same time as the trolley, stopping wherever there are passengers to be taken on—the average number of stops on a run is $47\frac{1}{2}$, although only 22 passengers can be seated.

Pawtucket is built up to the city limit of Providence, but it is a distinct city, with its own business district and large manufacturing interests. It is quite different from a purely residential suburb in that there is much traffic to and from it at all hours of the day by travelling and other business men, while it is like the suburb in that many people who live in Pawtucket work in Providence and vice versa.

The 10-cent fare is obviously no bar to the business man who can save 15 minutes in time and have a more comfortable ride. It is a convenience to the shopper who is hurrying to get home, or the person who wants to get to work in the shortest possible time. All of these persons together offer on the average a more even volume of business throughout the day than can be had



One of the Latest and Most Luxurious of Motor Transportation Coaches, the McKeen Highway Coach, Used in the Middle West—The Chassis Is Made by the United Truck Company, and the Body Is a Special Type, Resembling a Pullman Car in Appointments and Convenience.

on a run to a residence district, which is largely a matter of high peak load in the morning, a lower peak at noon, and another high one at five or six in the afternoon.

But to get the business that is available in the middle of the forenoon and afternoon it is necessary to offer a quicker trip than can be had by other means. These considerations moved the company to use touring cars instead of 'buses on truck chassis on the Pawtucket routes and make it substantially an express service.

It was necessary also to offer some advantages that would attract traffic from the many small cars that were already in operation. The larger, more luxurious, cleanly washed and polished cars driven by men in uniform accomplished that. Most of the small cars were al-

lowed to become muddy, their paint had peeled and lost its lustre, their drivers were frequently unkempt in appearance.

Women, especially, prefer to ride behind the uniformed driver and this is particularly true of those past middle age. The uniform is a symbol of organization and responsibility. Passengers unconsciously assume that the man in uniform will conduct them as carefully as the railway and street car men, and that they will not be frightened by the wild driving and hair breadth escapes of the irresponsible driver.

This is theory, but it has been amply verified by practise. At Exchange place, Providence, the cars line up, the first car to come in having the first and most prominent place in line. Yet constantly people walk past four or five of the or-

ble of rebuilding it, and who has worked out alterations in design and material which strengthen the cars in the parts which, under the peculiar conditions of the business have been found to be unsuitable.

Special Equipment Required.

In this service the wear on the brakes on the 'buses has been found to greatly exceed the calculations of the makers, and it has been found necessary to install larger brakes and replace the brake rods with more durable steel tubing. Among the passenger cars the weaving in and out of traffic has shown the regular steering gear to be inadequate and a special design has been worked out.

The cars are kept in perfect condition. If they were new and had just come from the factory they could not operate more smoothly and silently. Great care is devoted to the tires to get the utmost wear from them. Inflation pressures are noted very accurately and it is the policy of the company never to wear a tire to the point where it will blow out.

In the first place the blow out and the delay on the trip would probably turn passengers against the service and influence them to take the street car next time. Then if the tire is not completely gone it can be sold for a dollar or two, which will probably more than equal the value of the mileage still in it. Furthermore, by preventing blow outs the company saves a \$7 tube that would otherwise be ruined.

The starters are an important part of the service. Their uniforms advertise it. They are on hand to aid women in getting into the cars. They use their wits in directing the cars.

If it is wet they rearrange the routes—which is of no consequence in an express service—to keep the cars off the hills. They keep constantly informed about the amount of traffic available at either end of the routes. If there is business at one end and not much at the other, they hurry the cars back only partially loaded, while they hold them for full loads where most business is offered at that particular hour. They send out one car with a pair of vacant seats to pick up chance traffic along the route and hold the next for a full load and a straight express run.

A complete set of rules has been prepared and printed for the benefit of the chauffeurs. These contain such items as:

All chauffeurs shall report 15 minutes before starting and they shall be cleanly shaven and dressed in uniform with shoes shined. We shall expect chauffeurs to wear



View of the Interior of the McKeen Highway Coach, Showing the Unusual Windows and the Individual and Comfortable Chairs for Passengers—Heating Is from the Exhaust of the Gasoline Engine.

dinary jitney cars to take a Metropolitan company car with a neatly uniformed driver.

Competition has wrought a big difference in the character of the jitneys since they began running. At first nearly all were Fords. Then a Reo appeared and began at once to get more than its share of business, and Reos have become quite common. The public shows a marked preference for the larger and newer cars.

The Metropolitan company, however, did not attempt to supply new cars. It went into the market and bought second-hand four-cylinder Cadillacs, which it then rebuilt in its own shops.

The company was fortunate in having a very competent master mechanic, who is an excellent judge of the condition of a car, is perfectly capa-

clean, white collars at all times.

Each chauffeur shall keep an accurate account of number of gallons of gasoline and oil used and number of miles run on running card.

In running all cars the rule is safety first. Never take a chance.

Do not accept or allow any passenger to pay fare on entering car. Collect from each as they leave and by so doing avoid confusion as to who did and who did not pay.

Do not stop or start your car suddenly. Do it so that it will not disturb your passengers.

Do not stop for intoxicated persons. If he does not get on you will not have to put him off.

Hires Good Grade of Labor.

The company hires the best men it can get and pays higher than the ordinary wage for the work. There is a suggestion box in the garage in which the men can drop notes suggesting changes in systems or methods. If these are accepted they are paid for liberally.

The company believes that individual jitney operators cannot make the business pay. It believes, however, that there is a satisfactory return in the business and a good future when it is worked on right large scale methods. It has kept very detailed records of costs, but it will not divulge these because of the possibility that competitors might take advantage of them.

It is apparent, however, that six passengers carried slightly more than four miles yield a revenue per car mile of not more than 15 cents. That is when the traffic is sufficient to fill the cars. Frequently they run partly empty and then it is less. The cars are able, if the business is available, to make two round trips an hour, and their best earnings during the busy periods of the day would be about \$2.40 cents an hour.

This seems like a small revenue for so large a car and seems to bear out the opinion of the company that only by the utmost efficiency in getting the most out of money spent for gasoline, oil, tires and upkeep can such a service be made a success.

The company is building up a steady clientele that looks for the gray uniform and travels regularly in its cars. On the size of this patronage its ultimate success will probably depend.

There is still some uncertainty as to the results for the jitney service when winter comes. To prepare for it the company has worked out a small, comfortable 'bus body, suitable for a passenger car chassis, and heated with a stove drawing its heat from the exhaust. These will be tried experimentally when cold weather comes and put on all the cars if they prove a success.

SKIDDING CAUSES ACCIDENTS.

Usually when an automobile accident occurs the newspapers attribute it to faulty steering

gears or imperfections in the brakes or other mechanism. But it is beginning to be realized that the real cause of many of these accidents is the failure of tires to stick to the road and prevent skidding.

The secretary of the A. A. A. was recently himself the victim of one of these smash ups, due to skidding. Many of the accidents result, not from the familiar back wheel skid, but the front wheel skid, which either turns the car over or causes it to land against a curbstone or telegraph pole.

As a precaution many motorists are beginning to use tire chains not only on the back wheels to prevent drive slip and skid, but in front also. The chains are fastened to the tires so that they do not pull and lacerate them every time the brakes are applied. They have sufficient ability to "creep" to avoid that difficulty. They do not dig into the surface of the tires so much as would the stones of a fair roadway.

WOULD ELIMINATE CUT OUTS.

E. V. Hartford, president of the Hartford Suspension Company, says that an organization is being considered in New York to demand of the next legislature that no car which has a muffler cut out be admitted to registration in the state. The present city ordinances of New York City forbid the use of the cut out, but it is still employed to a considerable extent on the boulevards and drives. Herbert Chase, mechanical engineer of the Automobile Club of America, declares that the cut out has no influence on the power of the motor, at least until it is operating faster than 1000 revolutions per minute. Mr. Hartford urges the formation of a "Safety First and Silence Second" society, and offers to aid in getting members for such an organization.

NEW FAR WESTERN TOUR.

The Georgian circuit is the name of a 500-mile scenic tour over roads whose improvement is being brought about by civic bodies of Victoria, Vancouver, Seattle and Tacoma. The towns it touches are Victoria, B. C.; Port Angeles, Port Townsend, Olympia, Tacoma, Seattle, Everett, Bellingham and Blaine, Wash., and New Westminster, Vancouver, Nanaimo, Duncan and Victoria, B. C. By making side trips the tour may be stretched to cover 1400 miles, all through interesting country. Customs officials on both sides co-operate with tourists and make it pleasant for them.

PRACTICAL MOTOR CAR REPAIRS.

MANY motorists equip their cars with high-tension magnetos in place of the present low-tension types. Usually these have a set

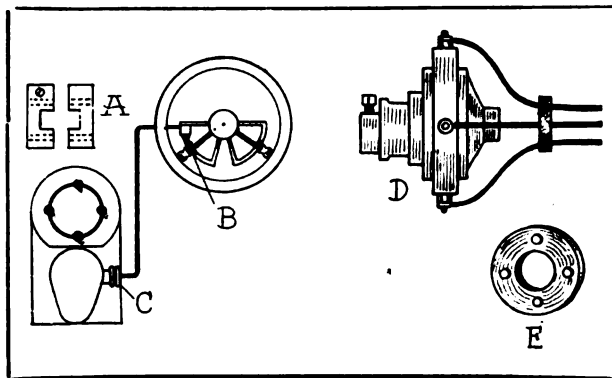


Fig. 93—A-B-C, How to Make a Switch for High-Tension Magneto; D-E, a Practical Support for Timer Wires.

spark, and, therefore, the spark lever on the wheel is not needed. In these circumstances a very satisfactory switch can be made, as shown in Fig. 93.

Shape two small pieces of fiber as shown at A. Attachment can be made to the quadrant by bolting the two together, as illustrated. Next drill the top fiber block so that a metal terminal may be inserted on the side facing the driver. Strip one end of a well insulated wire and secure it to the terminal (B) of the fiber block. The other end (C) is attached to the magneto terminal. When the spark lever is in the position as shown in the illustration, the circuit is open and the current is free to flow to the spark plugs in the cylinders, but by moving the lever so that it contacts with the metal screw, the circuit is instantly closed and the motor will stop. This plan is extremely simple and convenient, and does not make it necessary for the operator to reach over to the dash.

SUPPORT FOR TIMER WIRES.

The primary wires fitted to the commutator are usually given little if any attention until ignition trouble arises. The usual method of wiring allows the leads to contact with each other and twist so that it is difficult to locate any wire without tedious tracing. A better plan is shown in Fig. 93 D. In a circular piece of fiber about $\frac{1}{4}$ inch thick and $1\frac{1}{2}$ inches in diameter drill four holes as shown in Fig. 93 C, they be-

ing sufficiently large to permit the passing through of the wires, yet preclude play and chafing. If desired, the firing order of the cylinders may be stamped on the fiber, so that a missing cylinder can be speedily located.

LOCATING MISFIRE ON A FORD.

Many Ford car owners prefer to install the master vibrator, instead of using the four separate vibrators. It is admitted that this instrument has many advantages, but it must also be admitted that a missing spark plug is much harder to locate. A simple way to overcome this is illustrated at Fig. 94. Instead of breaking the adjustment of the four separate vibrators when the master vibrator is installed, they can be left in correct relationship except that the hammer and the screw must be forced into temporary contact by small pieces of rubber placed under the hammers. When necessary to test the plugs the rubber pieces can be removed, and by listening to the action the plug that misfires can be easily located. The master vibrator operating in conjunction with the coil vibrator will do no harm for mere testing purposes, but after locating the missing plug, all vibrators except that on the master coil should be wedged.

REMOVING CARBON.

Carbon can be easily removed from the cylinders by the use of the device shown in Fig. 95 A. It is an ordinary housekeeper's metallic wash

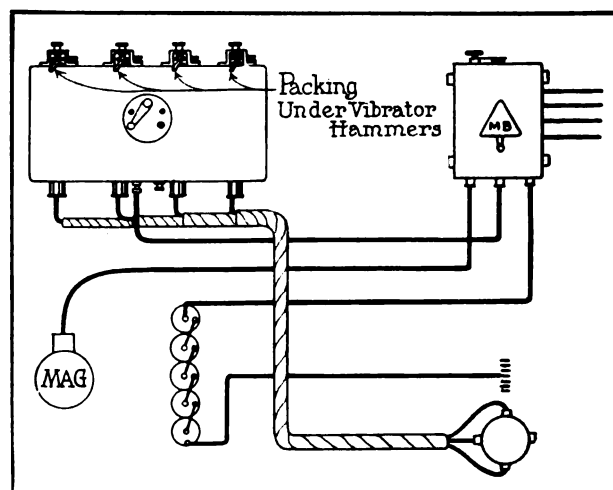


Fig. 94—Wiring Diagram of the Ford Car, and Showing How Misfire Can Be Easily Located.

cloth, commonly used for cleaning pans. The type preferred is that in which the rings are made with two or more coils of wire, as at B.

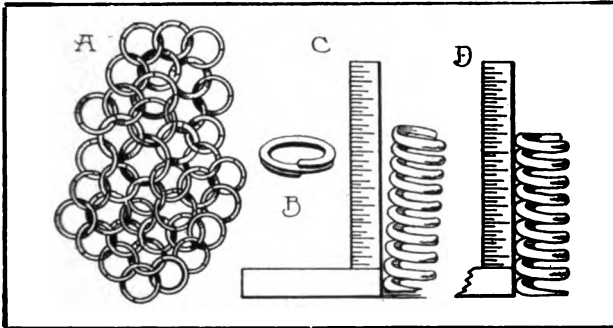


Fig. 95—A-B, Housekeeper's Wire Wash Cloth for Removing Carbon from Cylinders; C-D, Testing Valve Springs.

This kind is very strong, and the ring is not easily forced apart. Roll it up as tightly as possible and, after removing the valve cap on the cylinder head, drop it in the cylinder. Operate the motor on the remaining cylinders for about five minutes and most of the carbon will be removed from the cylinder. Repeat the operation in each cylinder.

VALVE SPRINGS.

Valve springs of the same diameter throughout are not always square at the ends. If the valve guide is worn, this condition will often cause the valve to seat unevenly, and the resulting loss of compression will be difficult to locate. A valve spring can be tested by standing on a level plate and placing a metal square against it, as in Fig. 95 C. If the spring does not stand perfectly upright, it can be remedied by grinding the ends, as shown in Fig. 95 D.

AUTOMOBILE PIT.

Frequently repair shops and garages reserve the upper floors of the building for repair work. Work that must be done from underneath the car can be accomplished much easier if a pit be installed. A small ordinary packing case will serve well for this purpose. The box used should be of the same length as the distance between the beams in the section of the floor selected, which should not be directly above the entrance to the ground floor. Fasten the case in position by long wood screws and then run two metal bands around it and attach to the beams as shown in Fig. 96. Of course the bands should be secured to the box. A cover can be easily made to take place of the flooring that is re-

moved, when the pit is not being used. The bottom of the pit can be made firm by connecting the two straps by a metal band, as illustrated.

PORTABLE WOODEN HORSE.

A portable wooden horse like the one shown in Fig. 97 II, can be used to advantage for such work as removing the engine from its bed, raising the body, the chassis, etc. The horse can be made to any desired height and width, but it is essential that strong material be used. A six-inch joist will afford sufficient strength for the cross piece, if it is re-enforced by $\frac{1}{4}$ -inch sheet steel at the sides. Strong casters should be fitted to the feet. This arrangement makes it possible to carry the motor to the work bench with only one handling.

GASOLINE SPRAYER.

Garages and repair shops equipped with compressed air service can easily have constructed a gasoline sprayer with which to clean motors and other greasy parts of the machine. Near the top of a tank similar to that shown in Fig. 97 I, cut a hole in the side and solder a small metal pipe in place, as at B. One end of the pipe should be threaded to receive the connector of the air line, as at C. Near the other end of the tube a hole should be bored and a copper tube of small diameter soldered in place. This tube should extend almost to the bottom of the tank, as shown at D. Fasten a suitable length of metallic flexible hose to the pipe extending through the tank, as at E. A tapering nozzle can be soldered to the end of the flexible tubing and the apparatus

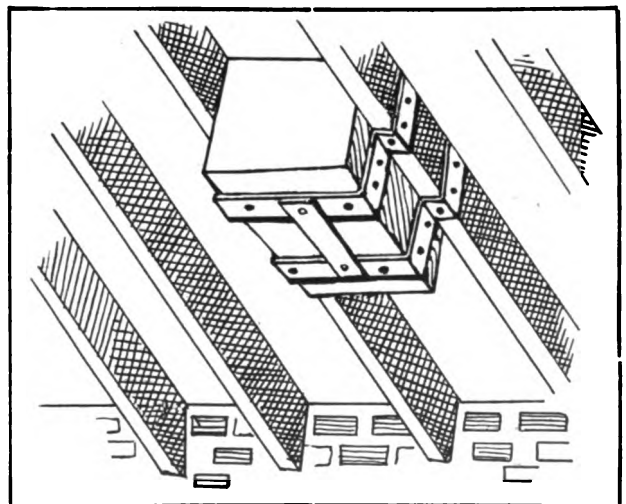


Fig. 96—How Automobile Pit Can Be Installed in the Garage Floor.

is ready for service. It is obvious that when the air is turned on, a vacuum is created and draws the fluid from the tank and drives it with great

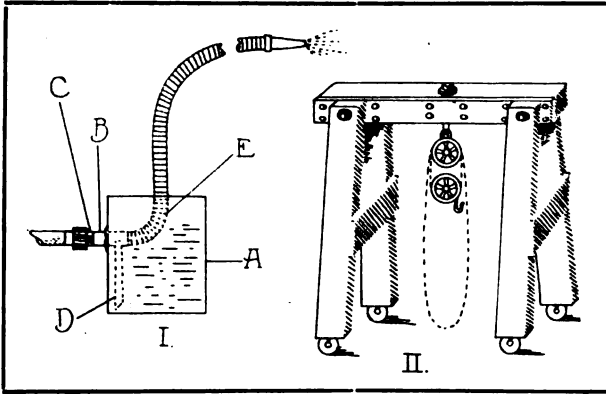


Fig. 97—I, a Practical Home-Made Gasoline Sprayer; II, How to Make a Portable Wooden Horse.

force against any article at which it may be directed. Kerosene can be used if desired.

QUICKLY ADJUSTED TIE ROD.

A motorist living in a very rough country district had considerable trouble with the alignment of the front wheels. This necessitated a great deal of adjustment, an operation requiring much labor. Fig. 98 represents the method he adopted to overcome this difficulty. The tie rod, B, which was constructed of tubing, was cut in half and the edges filed true. The inner surface of the tubing was then tapped and threaded, one section with a left hand thread and the other with a right hand thread. A piece of good machine steel was turned in a lathe and threaded so as to fit the tapped hole in the tie rod. Of course a left and right hand thread would have to be cut on the piece, as shown at A. Nuts were next fitted to the steel rod, after which it was turned into the tie rod, as at C. When the correct alignment of the wheels was obtained the nuts were tightly screwed against the ends of the tie rod so as to prevent the connecting piece from turning. It is obvious that for adjustment it was necessary only to turn back the nuts and then turn the adjusting piece. Solid tie rods can be equipped in this manner by drilling and tapping the same.

SOLDERING ALUMINUM.

Difficulty is often encountered when soldering aluminum. This is because of a slight film of oxide, which is the result of the exposure of the metal to the air. The oxide is not easily distin-

guishable, as it is of the same color as the metal. The operation can be made effective, however, if the part be thoroughly cleaned and then the solder applied. While the solder is still in liquid form scratch through the molten metal with a steel wire brush. This causes the oxide on the aluminum to break up, which, containing its own flux, absorbs the oxide and enables the surface of the aluminum to be tinned.

FITTING RUSTED BOLTS.

It often happens that a much needed bolt is found in the scrap pile and is so rusted as to make it difficult to turn in. If the part is hardened, a file is not always effective in removing this foreign substance. A simple remedy, however, is to coat the part into which the bolt is to be turned with a mixture of emery and oil. This method is very effective when the bolt is turned back and forth on the threads a number of times.

DRILLING HARD RUBBER FILLER CAP.

As the hard rubber filler cap is easily cracked, it is advisable to soften the material before drilling. This is accomplished by placing the cap in boiling water and allowing it to remain there for about five minutes. After removing from the water it can be drilled without injury.

CLEANING ALUMINUM.

Turpentine is one of the best liquids for cleaning the aluminum floor board or crank case of a car. A cloth saturated with it removes the grease and dirt as easily as gasoline and also gives a lacquered surface to the aluminum. Dirt and grease will not readily adhere to it.

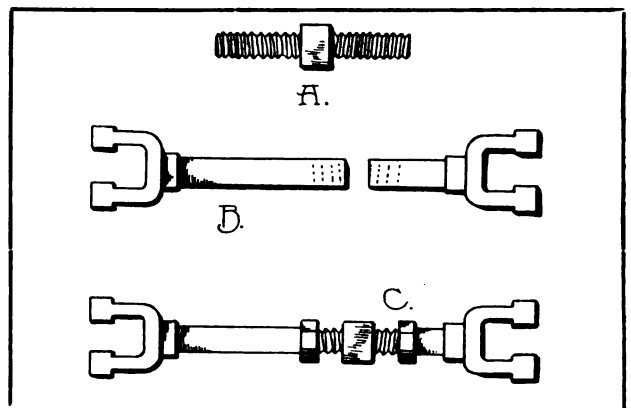


Fig. 98—Components Necessary to Make a Quickly Adjustable Tie Rod.

ENGLISH TARIFF ON MOTOR CARS.

THE movement for a tariff on motor cars and trucks imported into England, which at this time means American motor cars and trucks, was successful when on Sept. 21 Chancellor McKenna presented his budget to the British Parliament. This included, among many other plans for raising the government revenue, a proposal to tax imported motor cars 33 1/3 per cent. ad valorem. The budget seemed to be unanimously approved and there is little likelihood that this feature will not be adopted.

The effect of the act will undoubtedly be to cut down the sale of American motor cars in England, because in the present impoverished condition of the country an increase of one-third in the cost of automobiles will prevent many from buying them. It is quite probable, however, that the English manufacturers will promptly advance their prices on the cars that they are in a position to sell by an equal amount so that the proportion of the cars sold which are of American origin is not likely to be much affected.

The purpose of the provision is not to protect the British motor industry. In fact, the same budget included a provision to tax the extra war profits of British motor manufacturers to the extent of 60 per cent. That is, three-fifths of the amount by which their profits during the war exceeds those of the average for the three previous years must be turned into the government.

The budget dealt a blow to the high priced car in England by increasing the income tax 40 per cent. Of very large incomes one-third must now be paid to the government and a very large part of all large incomes. The evident intention of the present government of making the rich bear a large proportion of the war burden will tend to reduce the consumption of luxuries in Great Britain.

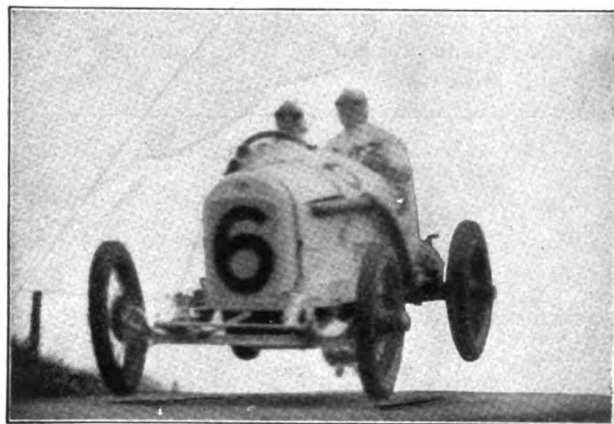
MARMON TO BUILD V MOTOR.

In a discussion of multi-cylinder V type motors, recently made by F. E. Moskovics of the Nordyke & Marmon Company, it was stated that in the view of the Marmon company there is nothing inherently wrong with the V principle and that when a satisfactory magneto ignition is developed for it and the engine itself is perfected, it will prove the best of all motors. It is also said that the Marmon company seven years ago

built a V type eight and from its experience is satisfied that that engine will not satisfy owners of the best cars. The impression made by the statement is that in due time, after careful experiment, the Marmon company may offer a V type 12.

STUTZ CAR JUMPS FROM ROAD.

The accompanying photograph shows one of the Stutz cars in the Elgin races with all four wheels off the ground as it shot over a bump. This is a very hard test on tires, as the \$2500-pound car came down on them with great force at the high speed with which the car was trav-



Stutz Car. Equipped with Goodrich Silvertown Cable Cord Tires, Bouncing Over a Bumper in Elgin Race.

elling. It shows the great strain on tires imposed by high speed races. The tires on this car were Goodrich Silvertown Cable Cords, which have been on the winning cars in almost every important race run this year in America, and have shown great length of life at very high speeds.

STUDEBAKER IMPROVED BATTERY.

A new rubber separator perfected by the Willard Storage Battery Company has been adopted for its product by the Studebaker Corporation. This is a thin partition with 4000 holes in a five by six-inch sheet, through which the fluid passes evenly. At the same time it affords perfect insulation. The Studebaker car is the first to adopt the device, which the company declares will improve battery service considerably.

"NORMA" BEARINGS TO BE MADE IN U. S.

Norma ball and roller bearings, which had been imported before the war in large quantities and used largely in the construction of magnetos and lighting and starting sets, are to be manufactured now in this country along with the company's complete line of ball and roller bearings of all sizes and types adapted to all uses.

As early as 1912 a small shop was established in America to determine whether American material and American labor could be made to duplicate the imported product and the results were very gratifying. At the outbreak of the war the importers had a large stock on hand in this country and several heavy shipments in transit, which arrived safely.

Equipment of the American shops with machines and men to turn out a large output here began immediately and is being continued as the demand increases.

HOW 1916 PRICES WERE REDUCED.

The following table gives the extent of the 1916 price reductions on various well known makes of cars:

Franklin	\$200	Stearns-Knight Four.....	\$235
Chalmers	125	Studebaker Six	400
Hudson	200	Studebaker Four	100
Hupmobile	115	Velle	195
Jeffery	275	Paige 46	100
Maxwell	95	Abbott	100
Mitchell	325	Allen	100
Oakland Four	200	Herff-Brooks	215
Oldsmobile	490	Dort	90
Overland Four	325	Crow	475
Overland Six	330	Ford	50

REASONS FOR PACKARD PRICE RAISE.

The announcement recently made by the Packard Motor Car Company that models of its cars on the short wheelbase "Twin-Six" chassis would be increased by \$150, while that on the long wheelbase would be increased by \$200, is explained by C. F. Tollzein, purchasing agent of the Packard company.

It is due to the higher cost of materials, the announcement states. The original lot of material was purchased at the old prices and all orders received before Sept. 17 will be delivered for the amounts originally announced.

The items on which the increase is based are \$50 per car for aluminum, in which are used about 300 pounds of castings, which have increased 12 cents a pound; 110 pounds of sheet

aluminum, which has increased 11 cents a pound, and aluminum moulding, which has increased \$1.50 per car. Brass and copper have increased four cents a pound and for the first time brass is more expensive than copper because of the high price of tin and spelter.

The 250 pounds of brass castings per car represent an increase of \$10 per car. Materials for radiators have advanced \$2.50 per radiator. Lamps have gone up \$2 per set. Crank shaft and connecting rod bearings have advanced \$2.50 per car. The advance on door handles is 50 cents per car. Steels have increased one-half cent a pound, and carbon steels \$4 per ton. The advance from this source is \$13 per car. Tungsten steel for valves cost \$2 more a car, and ball bearings cost \$3.50 more per car. Frames cost \$4.50 more. Trimming leather has advanced \$17.50 more a car. These, with less important items, make up from \$150 to \$200 a car additional cost.

HYATT NAMES SALES TALK WINNERS.

In a booklet entitled "The Six Best Sellers," the Hyatt Roller Bearing Company of Detroit has announced the result of its recent contest for the best selling talks on Hyatt roller bearings. The winners are F. D. Serf, retail sales manager of the Ralph Temple Automobile Company of Chicago; Henry Crowther, vice president of the Crowther Motor Car Company, Philadelphia; Albert E. Hoyt, Chevrolet Motor Company of Illinois; J. E. Staley, Holsman-Stevens Automobile Company of Des Moines, Ia.; Curtis M. Betts, Mitchell Automobile Company, Chicago; L. S. Vaughn, Oklahoma Oakland Company, Oklahoma City. So many good papers were received that prizes and special mention were given also to a number of other salesmen.

NIAGARA CAR IS VERY LIGHT.

Exceptional lightness has been secured in the new Niagara Four by the use of drawn steel aluminum and drop forgings instead of malleable and cast iron, according to the manufacturers. The car, which sells for \$740, has a 112-inch wheelbase and a 36-horsepower motor. Its design is standard in every way. The car is said to be one which has been gradually developed for seven years, but the name has recently been changed. William G. Miller, formerly vice president of the Pullman Motor Car Company, is vice president and general manager.

CAR ACCESSORIES AND EQUIPMENT.

SPRING OILER STRAP.

Spring Oiler Adaptable to All Springs and Feeds Oil to Leaves by Natural Action of Spring.

The Leather Tire Goods Company, Niagara Falls, N. Y., is marketing the spring oiler shown in the accompanying illustration. It consists of a strap having wicking on the inside, and is so designed as to buckle around the spring at a point just inside the clip and holds the leaves together. It is at this point at which there is the most motion between the leaves. The wicking is saturated with lubricant, which works between the leaves by the natural motion of the spring. A hole at the top of the strap, which has a



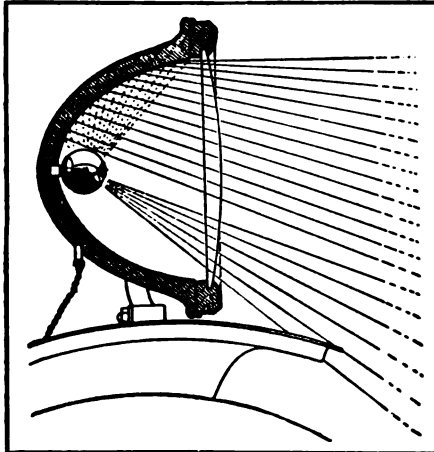
Spring Oiler Strap.

leather cover over it, affords an easy means of supplying the oil to the wicking when necessary. As the straps are adjustable, the oilers may be fitted to all cars. They are easily attached and retail at 25 cents each. Four oilers are sufficient for the Ford car, while other cars require from eight to 16, according to the type of spring used.

PERRIN NO-GLARE.

Attachment Which Eliminates Glare from Electric Headlights and Intensifies Light on the Road.

Tests have proven that the danger rays, or those which temporarily blind oncoming drivers and pedestrians, are those which are first cast to the lower half of the parabolic reflector from which they are reflected forward and upward.



Perrin No-Glare Attached to a Headlight.

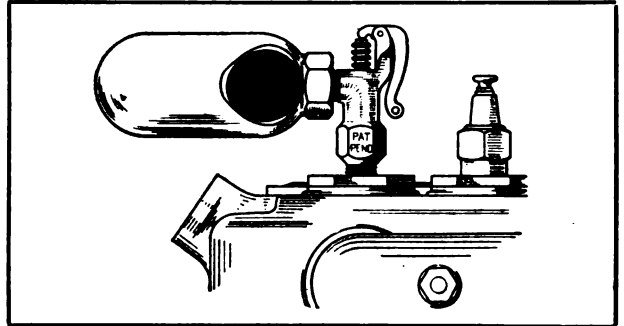
To meet the requirements of safe night driving, as well as the approval of the most rigid laws forbidding glaring headlights, the Perrin Manufacturing Company, Detroit, Mich., is producing an attachment for electric light bulbs which in no way dims the light, but tends to intensify it on the road. It is termed the Perrin "No Glare," and is a deflector made of special aluminum, which fits around the lower half and tip of the bulb. The inside of the device is a polished mirror that casts the danger rays against the upper half of the parabolic reflector, from which they are cast forward and downward.

The device is designed so that the rays do not raise more than four feet from the highway. As all the light is concentrated strictly to the road, it is possible to illuminate the path of travel for a farther distance than with the open lamp. The attachment is sold by most dealers and is priced at \$1 per set of two.

BUELL EXPLOSION WHISTLE.

Warning Signal Which Attaches to Cylinder Head—Made for All Cars and Permanently Guaranteed.

The Buell explosion whistle, illustrated herewith, is manufactured by the Buell Manufacturing Company, 1142 E. 46th street, Chicago, Ill. It is designed to re-



Buell Exploding Whistle.

place the ordinary priming cup in one of the cylinders, and is operated by part of the exploded gas in the cylinder. It is obvious that considerable pressure is directed into the powerful warning signal and commands attention above all other noise. The maker states that the whistle takes but little power from the motor, as the valve opening is very small. The whistle valve is operated by attaching a cable to the rocker arm and running it to a position convenient for the driver.

The whistle requires no attention when once installed. Sooting is prevented by the high pressure used. On account of its simple, yet rugged construction, the instrument is guaranteed for life. It is made in standard sizes and in two models, one having a three-tone chime, which retails at \$6, and the other, a single tone, which sells at \$4.25. As the Ford car is not equipped with priming cocks, a special type of spark plug is made with provision for the attachment of the whistle. The plugs retail at \$1.25 each.

AUTOMATIC TIRE GAUGE.

Nurinkle Prevents Over Inflation by Exhausting All Air After the Desired Pressure Has Been Reached.

An automatic tire gauge warranted to accurately register the amount of air pressure in the tire and also to prevent over inflation, is being manufactured by the Nurinkle Company, Indianapolis, Ind. In inflating a tire one end of the gauge is attached to the valve stem and the other to the air line. The gauge is set at the pressure desired by turning the knurled cap at the top to the corresponding marks on a scale. The gauge will not permit over inflation, as all surplus air is released after the desired pressure has been obtained. To find the pressure actually in a tire the knurled top is turned down until the air begins to exhaust. The instrument is guaranteed to be accurate, safe and reliable and it retails at \$1.25. Please mention this publication in addressing the manufacturer.



Nurinkle Automatic Tire Gauge.

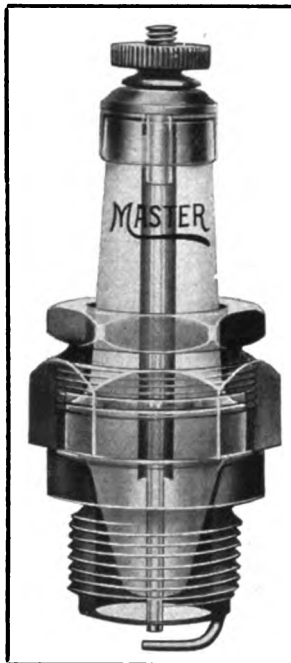
MASTER SPARK PLUGS.

Heavy and Substantially Constructed, They Have Been Subjected to Gruelling Tests.

Master spark plugs, made by the Hartford Machine Screw Company, 508 Capitol avenue, Hartford, Conn., a concern with nearly 50 years of successful manufacturing experience behind it, are designed to embody all the features essential to the making of a perfect plug. The core has ample provision for expansion and contraction under the terrific heat engendered in service and consequently is declared unbreakable. A further guarantee against that injury is its material, which is of the finest obtainable imported porcelain. A generally accepted guarantee of its high merits is that the United States government has adopted it exclusively for the navy.

Before acceptance the government subjected 6000 plugs to a series of gruelling tests lasting a year, and in no instance was a defect found. A few of the plug's qualities can be summarized as follows: It will not carbonize or short circuit; it will always fire regardless of an overabundance of oil; it will produce a hot spark on a weak circuit, and it will not leak compression.

The plug is adapted to all types of motors, including racing cars, and is made in three models. The regular length Master plug retails at \$1. The extra length, designed for motors having extra thick water-jackets, and a special model for Ford cars, sells at \$1.25 each. If, after 30 days trial, the plugs do not give full satisfaction, the price will be refunded.



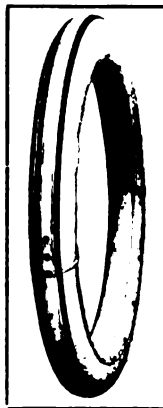
Master Spark Plug.

Several types of spare tire cases are being marketed by the Allen Auto Specialty Company, 1926 Broadway, New York City. These are designed to prevent water, oil or heat from injuring the casing. High quality material and workmanship is employed and every case is guaranteed to be free from defects in manufacture. Each size is cut to fit the make of the non-skid or smooth tread tire that it is designed to fit. They are provided also for demountable rims and wire wheels. For small additional charges imported materials in colors to match the car can be secured. In the accompanying illustration is shown style three, which is the company's latest product. To those who mention The Automobile Journal the Allen company will promptly supply further information regarding its product. Among these are inner tube bags (double and single), tool and battery box covers, dress suit case covers, trunk, lamp, horn and magneto covers, radiator pads and covers, and starting crank holders. The Allen tyreometer is an accurate tire inflation gauge that is fully guaranteed and retails for \$1.

THE ALLEN TIRE CASE.

Cases of Many Varieties to Protect Spare Tires Offered by Widely Known Accessory House.

Several types of spare tire cases are being marketed by the Allen Auto Specialty Company, 1926 Broadway, New York City. These are designed to prevent water, oil or heat from injuring the casing. High quality material and workmanship is employed and every case is guaranteed to be free from defects in manufacture. Each size is cut to fit the make of the non-skid or smooth tread tire that it is designed to fit. They are provided also for demountable rims and wire wheels. For small additional charges imported materials in colors to match the car can be secured. In the accompanying illustration is shown style three, which is the company's latest product. To those who mention The Automobile Journal the Allen company will promptly supply further information regarding its product. Among these are inner tube bags (double and single), tool and battery box covers, dress suit case covers, trunk, lamp, horn and magneto covers, radiator pads and covers, and starting crank holders. The Allen tyreometer is an accurate tire inflation gauge that is fully guaranteed and retails for \$1.

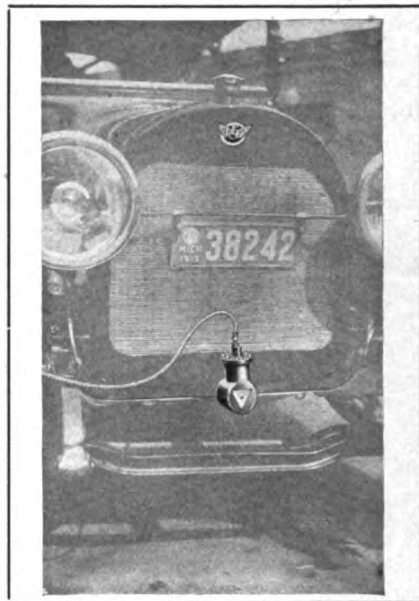


Allen Style No. 3 Tire Case.

DETROIT TIRE PUMP.

It Inflates Tires and Couples to End of Crankshaft by Shaft Passing Through Crank Hole.

The tire pump illustrated herewith is manufactured by the Detroit Motor Accessories Company, Detroit, Mich., and is specially designed for Reo cars that are equipped with self starters. Tools, brackets, gears and other equipment are unnecessary for attachment. The method of operation is simple, as all that is necessary is to insert the pump shaft into the crank hole at the base of the radiator and start the motor. The end of the pump shaft connects with the end of the crankshaft, thus affording a direct drive. It can be conveniently carried in the tool box and attached to the car in about 30 seconds, and it is possible to inflate a tire from flat to standard pressure in four minutes. Oil cannot be pumped into the tires. The device is durably constructed, finished in black enamel and retails complete with hose and gauge at \$7.75. The Detroit company makes tire pumps for other models of cars.

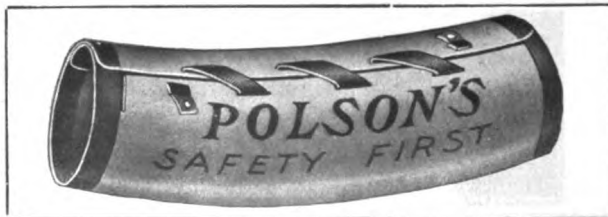


Detroit Tire Pump Installed on Reo Car.

SAFETY FIRST BLOW OUT PATCH.

Inside Blow-Out Patch Which Fastens in Such a Manner as to Prevent the Enlargening of the Break.

The Polson Rubber Company, Kansas City, Mo., is the manufacturer of the blow-out patch shown in the accompanying illustration, which is listed as the Safety First. The patch is so designed as to encircle the tube and to be held in position by a self-adjusting strap. Statement is made that when the tube is inflated the patch expands at the ends and tightens at the centre, which prevents it from pouching and enlargening the hole in the outer casing. The manufacturer warrants it to be proof against rim cuts or side blow outs. The patch is made of extra stout white friction fabric and vulcanized over molds, so that a perfect fit is obtained. The ends are made of rubber as a precaution against cutting or pinching the tube. The patches are made in 10-inch



Polson Safety First Blow-Out Patch.

lengths and the diameters vary by half inches from three to five inches. The price varies accordingly, ranging from 80 cents to \$1.40 each.

TO REVOLUTIONIZE LUBRICATION.

AN ANNOUNCEMENT, which if borne out by results, will change not only automobile manufacture, but every variety of mechanics, is made by the Dann Spring Insert Company of Chicago, which is said to have perfected a bearing that can be used on any part of a machine and is self-lubricating, requiring neither oil or grease for that purpose.

The name given to this remarkable substance is understood to be Amalgamite, the "Velvet Bearing." Some of its results as suggested will be to abolish grease cups, eliminate the crank case oil reservoir, and abolish all oiling systems and lubrication difficulties. Scoring of cylinders becomes impossible and piston rings are unbreakable and never wear out. It is expected to enormously cut down production and maintenance costs.

Some other statements about this substance are that it is indestructible and everlasting and will outwear the life of the product in which it is used. It is unaffected by heat, cold, water, steam or shock.

A large railroad is said to be testing it for use on its locomotives, as are marine engine builders and makers of huge compressors. E. G. Dann, general manager of the Dann Spring Insert Company, is the inventor and patentee, and says that the mechanical world will be astounded when the details are known.

SCRIPPS-BOOTH EXPORTS GROW.

In the past few months large shipments of Scripps-Booth cars have gone from Detroit to France, Porto Rico, Cuba, Greece, Italy, Switzerland, Australia, New Zealand, South Africa, Ecuador, Portugal, Norway, Sweden, Denmark, Russia, Spain and the Philippine Islands. Most of the foreign representatives of the company are dealers who handle such cars as Mercedes, Austin, Rolls-Royce, Berliet and Sunbeam. "The Scripps-Booth is a Berliet in miniature," is a phrase that is much used to describe it in countries where that famous French car is known.

OVERLAND SIX CATALOGUE OUT.

A handsome catalogue of the new Overland Six has just come from the presses. It is well printed and carries in colors the paintings which have been used so effectively to illustrate the Overland magazine advertising. The catalogue

lays great stress on the size and the quality of the car offered for a low price and discusses in detail its features of construction.

THREE-QUARTER ELLIPTIC SPRINGS.

An analysis of the spring equipment supplied on models of American 1916 passenger cars has been made by the Hartford Suspension Company, maker of the well known Hartford shock absorber. There are in all approximately 100 different chassis models.

The semi-elliptic front spring is used on practically all of these cars, and on 56.52 per cent. of the models the three-quarter elliptic rear spring is applied. There is a reversion to the long flexible type of spring, but it is used now in a much lighter and flatter form than it was originally. Platform springs are used on only 5.8 per cent. of the chassis and semi-elliptic rear springs on 14.49 per cent. The cantilever spring is growing in popularity and is used on 21.73 per cent. of the cars.

WHAT THE BREAKER STRIP IS FOR.

The functions of the breaker strip in Goodyear tires is explained by L. C. Rockhill, manager of the automobile tire department of the Goodyear Tire and Rubber Company, as being that of protecting the tire from cuts and shocks like an armor and not otherwise adding to the strength of the tire. When tires are cut by glass or stones, the abrasion is frequently stopped by the breaker strip. It also tends to hold the rubber tightly to the fabric and resist its tendency to pull away. The breaker strip is tightly woven to prevent water or dirt from working into the tire.

It is poor policy to steer the car when not in motion. Not only is the entire steering mechanism strained, but the gritty road has a tendency to wear a flat spot in the soft rubber tread. Always place the car in motion before turning the wheels.

The usual proportion of air and gas in the modern engine is six to one, according to the weather and engine condition. Increasing the proportion to about 10 to one increases efficiency.



FOR 1916 three chassis are built by the Apperson Brothers Automobile Company of Kokomo, Ind., which are equipped with a wide range of body types. Two of these are six-cylinder and one is eight-cylinder, the latter being an entirely new car.

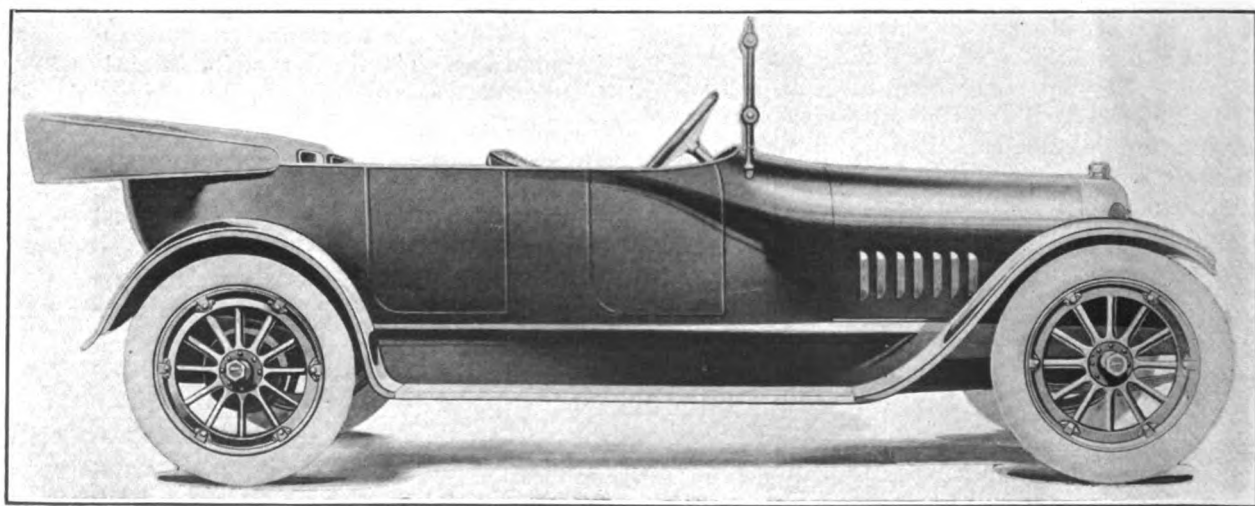
There are three bodies designed for the "6-16" chassis, a five-passenger type selling for \$1485, a seven-passenger sold for \$1550 and a four-passenger roadster sold for \$1550. The "6-60" chassis is equipped only with a seven-passenger touring body that is sold for \$2350. The eight-cylinder chassis equipment is either a seven-passenger touring body or a four-passenger roadster type, which are sold for \$1850.

The motor of the "6-16" chassis is cast en bloc with L head cylinders, having $3\frac{1}{2}$ -inch bore

and $5\frac{1}{8}$ -inch stroke. It is cooled by water circulated by a pump, a V-shape radiator and a pressed steel fan. The carburetor is a float feed type and is hot water jacketed. The lubrication is a self-contained positive forced feed type.

The transmission gearset is a selective sliding gear type with three forward speed ratios and reverse. The rear axle is an Apperson floating design with removable live axles. The tires all around are 34 by 4, on demountable rims.

The wheelbase is 122 inches in the five-passenger touring car, 128 inches in the seven-passenger and 128 inches in the four-passenger roadster. The machine is equipped with a combined electric lighting, starting and ignition system. The drive is on the left side, with the control



Apperson Model 8-16, Seven-Passenger, Eight-Cylinder Touring Car, Priced for 1916 at \$1850.

levers conveniently located in the centre.

The standard color treatment is Elgar dark blue for the body and wheels, and all metal parts are finished in black only. The purchaser has option of Apperson special green with black metal parts.

Characteristics of the Large "Six."

The motor of the large six-cylinder chassis is a T head instead of L head type, and is cast, like the smaller motor, en bloc. The cylinders are $4\frac{1}{4}$ -inch bore and five-inch stroke. The pump actuated water circulation is through a V-shape radiator and radiation is promoted by a pressed steel fan. The water pump is a sliding vane type.

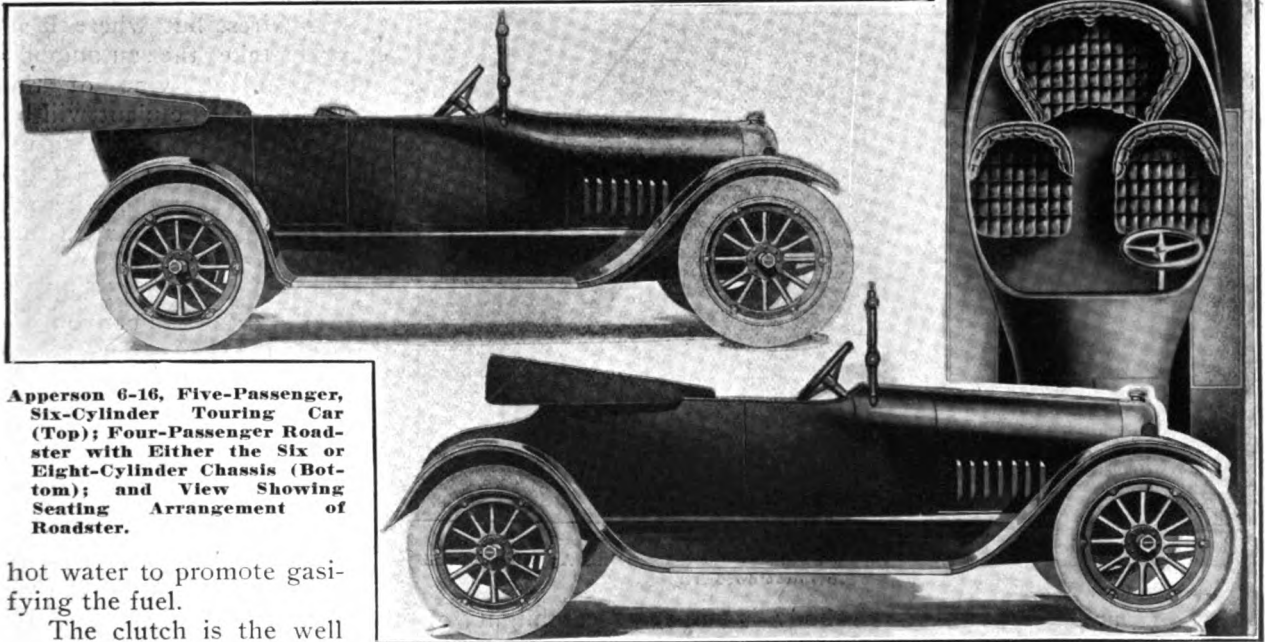
The motor is lubricated by a hollow crankshaft forced feed system, and the carburetor is an automatic float feed type that is jacketed with

lighting and ignition system, and the drive is left side with centre control. The color treatments are similar to those of the smaller six-cylinder bodies.

The New Apperson "Eight."

The new Apperson chassis is fitted with an eight-cylinder V type motor that is a long stroke type, the cylinders having $3\frac{1}{8}$ -inch bore and five-inch stroke. The cylinders are cast in blocks of four and mounted at an angle of 90 degrees on the crank case.

Differing from the six-cylinder motors, the engine is cooled by thermo-syphon water circulation. The characteristic V-shaped Apperson ra-



Apperson 6-16, Five-Passenger, Six-Cylinder Touring Car (Top); Four-Passenger Roadster with Either the Six or Eight-Cylinder Chassis (Bottom); and View Showing Seating Arrangement of Roadster.

hot water to promote gasifying the fuel.

The clutch is the well known Apperson compression band design and the transmission gearset the conventional three forward speed and reverse ratio selective sliding gear type. The axle, like that of the smaller chassis, is an Apperson shaft driven floating type from which the live axle shafts are removable without taking off the wheels.

The service brake is external contracting and the emergency brake internal expanding. The front springs are semi-elliptic and the rear springs three-quarters elliptic. The tires are 36 by four inches all around. The wheelbase is 135 inches.

The equipment includes an electric starting,

diator is used. The oiling system includes the hollow crank shaft oil ducts and is a positive pressure feed type. The carburetor is a full float automatic construction.

The gasoline tank has $15\frac{1}{2}$ gallons capacity and is located at the rear of the chassis, with vacuum feed to the carburetor.

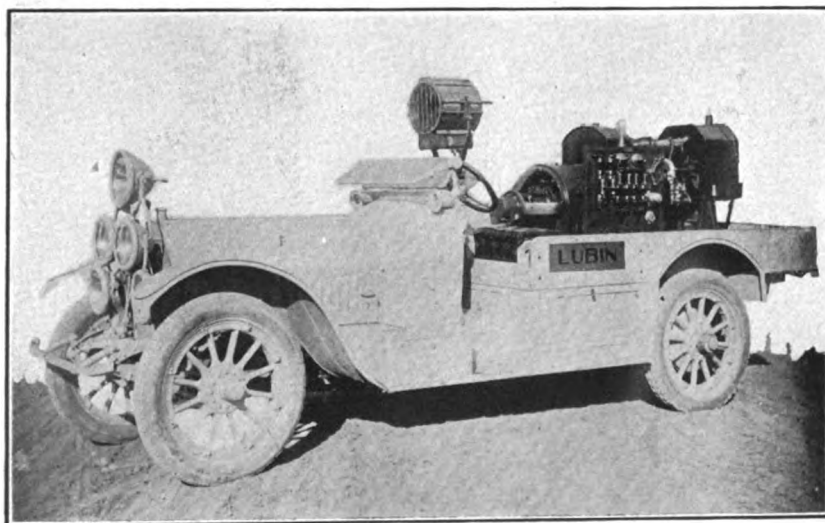
The usual three forward speed ratio and reverse selective sliding gear Apperson transmission gearset is employed. The rear axle is the standard Apperson floating construction, with removable live axles. The springs are three-quarters elliptic rear and semi-elliptic front. The tires, like those of the smaller chassis, are 34 by

4 inches all around. The equipment includes a combined lighting, starting and ignition system. The wheelbase is 128 inches.

Designs of the New Series of Bodies.

It is noticeable that the new series of bodies has been developed with designs to suggest a low centre of gravity and have small wind resistance instead of the higher and wider cross section styles, which have previously been typical of American bodies.

The hood lines are practically straight, with a very slight flare toward the cowl. Behind the windshield the sides fall away but slightly. They are high enough to afford excellent protection to the occupants and at the same time impress the observer as having a substantial appearance. Low running boards and close fitting mudguards heighten this effect.



Mitchell Car Equipped with 4,500,000 Candle Power Lighting Apparatus and Used for Night Motion Photography.

The four-passenger roadster body is an attractive novelty. In profile it much resembles the conventional roadster for two people. The lines at the rear do not gather quite as rapidly. The top is hung further back than is customary with the average roadster design.

Bucket seats for the driver and a companion are placed forward in the compartment, while the two rear seats are of the usual type, with plenty of foot room in the aisle. This arrangement places the passengers close together. When the well in which the rear seats are placed is not occupied the top cover can be drawn over it, protecting the seats from dust. It has ample facilities for storage, and the beauty of its appearance and novelty of arrangement should make it very popular.

The upholstery of all the models is an exceptionally deep and soft Turkish type, covered with No. 1 hand-buffed leather, with specially treated springs and a liberal packing of curled hair.

PHOTOGRAPHY BY SEARCHLIGHT.

Taking motion pictures at night or in the bottom of deep canyons, where the sun never penetrates, has been made possible. For the purpose a powerful electric generating apparatus and a great naval searchlight has been mounted on a six-cylinder Mitchell chassis at the direction of Romaine Fielding, feature director of the Lubin company, who has charge of its players and plant at Phoenix, Ariz.

The company has plans for making pictures many miles from electric lighting plants, in places where it is impossible to run wires, but where it is easy to take the automobile lighting plant. One of the uses to which the plant will be put will be that of lighting up the depths of the Grand Canyon of the Colorado, where a feature film will be staged this fall.

The lighting difficulties have prevented the canyon being used for such a purpose up to this time, but the trails and caverns can be fully illuminated by the new electrical equipment.

The generating plant is equipped with reels for running wires and the car has in addition a 12-inch Navy searchlight of the projector type. This is mounted on the seat beside the driver and can be used with the car standing still or running. The capacity of the searchlight is 4,500,000 candle power and when in operation it requires 25 per cent. of the full power of the engine.

A large fleet of Mitchell cars is used by the company for its trips to and from the settings used in its pictures.

DETACHABLE TOP FOR OVERLAND.

A detachable top by which the Overland model 83 can be used either as an open car or a limousine in winter weather is now being supplied. The top has been carefully designed to give it the lines of a luxurious closed car.



WHILE there has been no change in the price of Saxon cars for the next year, the machines have a number of improvements and refinements which add materially to their convenience, comfort and utility. The small four-cylinder roadster is priced at \$395, but it now has a three-speed ratio transmission gearset and the body has been redesigned to have a neater and more attractive appearance.

The six-cylinder car, which is sold for \$785, is equipped with both roadster and touring bodies. The most important change is perhaps the use of a two-unit starting and lighting system instead of a single unit as previously. There are a number of minor body refinements and some mechanical improvements.

The substantial correctness of the original Saxon six-cylinder chassis design is demonstrated by the fact that it is continued for a second year with practically no mechanical changes of consequence. The chief difference is the fitting of the new electrical system.

This system is the product of the Detroit Starter Company. Both the generator and motor are compact and are neatly mounted on the motor. They are on opposite sides and at the rear. The motor is at the right and is suspended from the rear supporting arm of the engine. It is coupled with the flywheel through a Bendix drive system. The reduction is 10 to one between the engine and the elec-

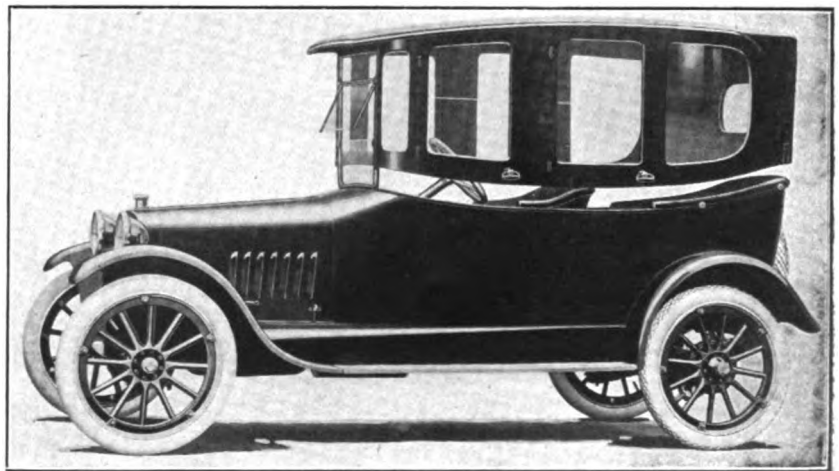
tric motor. The latter has proven to turn the motor about 100 revolutions per minute.

Generator on Left Side.

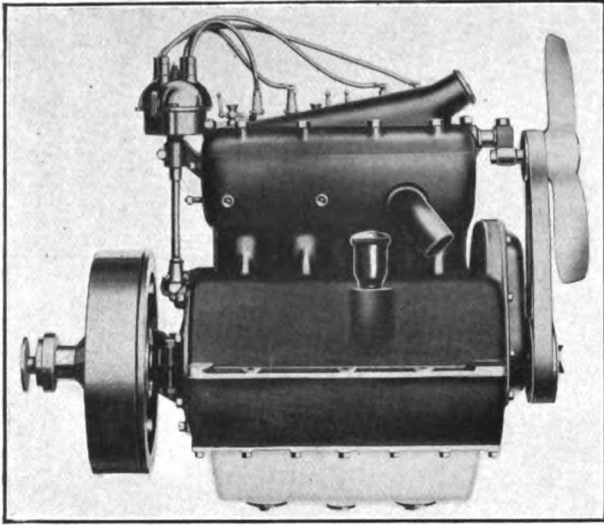
The generator, which is on the left supporting arm of the engine, is chain driven from the crank shaft. The drive is between the flywheel and the rear of the engine. A plate on the top of the generator fits on a trunnion pin attached to the supporting arm. The generator can be rocked away from or toward the motor to give a correct adjustment of the sprocket centres. Two set screws hold the generator in place. The machine is driven at twice the engine speed.

The battery charging is regulated by a Ward Leonard regulator, which cuts in at a vehicle speed of 10 miles an hour and maintains the charging rate at a prescribed value regardless of the engine speed.

Another noteworthy change has been the



Saxon Six Touring Car with Detachable Inclosed Top, Which Is Priced at \$935—Without the Top the Price Is \$785.



Right Side of the Saxon Four-Cylinder Motor.

adoption of Timken axles, which have been used for several months. The spiral bevel drive rear axle has also been adapted as standard equipment. This type is now in use in many cars and has been found to silence the buzz of the average bevel gear differential.

The engine with which this car is equipped will develop 34.7 horsepower at 2200 revolutions per minute. Its advertised rating is from 30 to 35 horsepower. The cylinders are cast en bloc and the upper half of the crank case is integral with them. The lower half, which also forms the oil reservoir, is pressed steel and is light and smooth. The cylinder head is detachable and is bolted on. Integral with it is the large water outlet to the radiator.

Valves Are Enclosed.

Valves are at the right and are completely enclosed to protect them against dirt and prevent noise. On the right side are also the inlet and the exhaust manifolds. There are separate castings bolted to the block. A Rayfield carburetor is mounted at about the middle of the casting and is easily accessible.

The valves have nickel steel heads welded to carbon steel stems. The pistons and rings are standard. A slight change this year is the substitution of a Burd high compression ring at the top of each cylinder in place of the eccentric ring formerly used. The remaining two rings are the old

type. There are three main bearings and four camshaft bearings. The camshaft is driven by helical gears.

Spark plugs, which were formerly over the exhaust valves, are now installed over the intake valves. The ignition current is from the storage battery and is sent through an Atwater Kent distributor. Lubrication is by pump to the main bearings with individual splash troughs under each connecting rod. The cooling system is a thermo-syphon circulation through a cellular radiator.

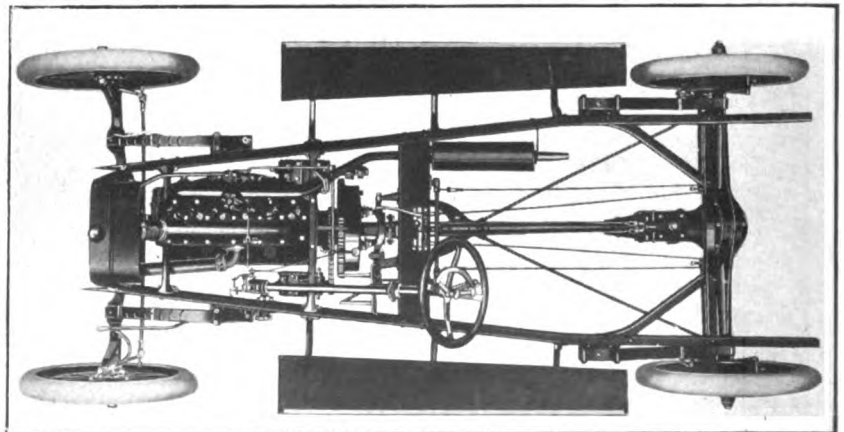
The multiple disc clutch, which has steel surfaces against Raybestos facings, is housed in the flywheel. There is a universal joint in the shaft and the shaft is fully protected by a large torsion tube. The gear box is carried on the rear axle. The gear shifting rods extend along the top of the torsion tube.

Cantilever springs are used at front and rear. The frame is narrowed from rear to front from a point a little forward of the rear axle. The rear axle is a three-quarter floating type with a pressed steel housing. The wheelbase is 112 inches and the tread either 56 or 60. The wood artillery type wheels are shod with 32 by 3½-inch tires.

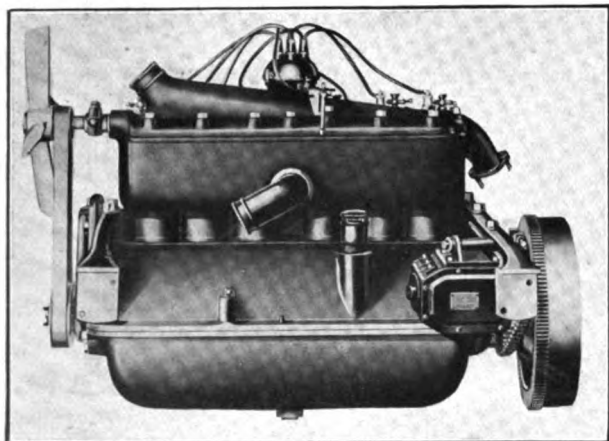
Three Speeds for Small Car.

The most apparent mechanical change in the small roadster is the three-speed ratio transmission gearset, which gives greater flexibility and better adapts its power for all operating conditions. This car has not an electrical lighting and starting system as standard equipment, but this can be installed for an extra cost of \$50. The car is regularly equipped with oil side lamps and acetylene head lights.

The clutch and brake pedals are adjustable to adapt them to the requirements of the driver.



Viewed from Top the Saxon Six Chassis Shows Very Neat and Compact Lines.



View of the Left Side of the Saxon Six Motor, Showing the Electric Starter.

The brakes have been improved by an increase in width of the drums from $1\frac{1}{2}$ inches to two inches. The drums are eight inches diameter.

As in the chassis, Timken axles are used. These are similar in design to the former equipment, save that the front wheel spindles are now chrome nickel steel instead of carbon steel. The motorcycle tires used last year have been replaced with a regular automobile tire of the same size, but having increased thickness of tread.

The motor is block cast with cylinders having bore of $2\frac{3}{4}$ inches and stroke of four inches. The carburetor is a special Mayer type with air and fuel adjustments on the dash. The fuel is fed by gravity from a six-gallon tank under the dash. Atwater Kent ignition is employed. The oiling system is a combination force feed by a pump through leads to the main bearings and a constant level splash. The cooling is by a thermo-syphon water circulation through a cellular radiator and fan.

The valves have nickel steel heads and carbon steel stems. The camshaft is drop forged of special steel with integral cams. It is driven by helical gears and is carried on two bearings. The crankshaft also is a two-bearing type.

The clutch is a multiple disc that has Raybestos facings against steel. The transmission gearset is a three forward speed ratio and reverse sliding gear type mounted on rear axle. The axle is semi-floating and is in a pressed steel housing.

There are two sets of brakes on the rear wheels. The tires are 28 by three-inch clinchers and the wood wheels are artillery type. Cantilever springs are used front and rear.

New Six Roadster Body.

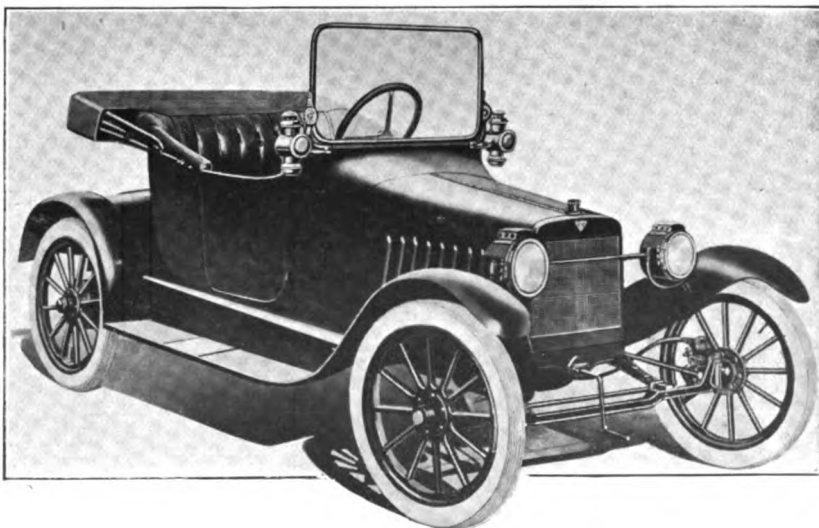
The roadster body fitted to the six-cylinder chassis has two seats and is very attractively designed. The rear deck is proportioned to balance the hood and has a very pleasing effect.

The body sides of the six-cylinder touring car have been raised slightly by the addition of a molding completely the way around it. This is known as the garnish strip and it adds much to the appearance of the car. The tonneau seats have been widened one inch and are now $46\frac{1}{2}$ inches wide. The back of the front seat has been tilted toward the rear one inch to make it more comfortable. Plain upholstery without tufting has been used.

A new color has also been adopted for the six-cylinder body. It is a pleasing shade of olive, which is known as Cadillac green. It gives the car a more individual appearance than the blacks and blues so commonly used.

In conformity with the popular trend, this year a detachable top is supplied for the six-cylinder touring car at an additional expense of \$150. This converts the car into practically a closed coupe for winter use. The means of attachment are simple and efficient.

The body design of the four-cylinder roadster has also been improved. The windshield filler skirt, a piece of cloth which bridged the gap between the bottom of the windshield and the top of the cowl, is no longer used. The new body is brought up to meet the windshield without a



The New Saxon Four-Cylinder Roadster Listed at \$395 and Includes Three-Speed Transmission, Larger Body and Several Refinements.

break. The windshield itself has been enlarged and converted into the ventilating type. It is hinged to swing either way, and when the top section is swung outward there is a gap below, through which air can enter. The colors are the blue and black previously used.

An enclosed top is also supplied for this car at an expense of \$60, which will convert it into a small and very cosy coupe.

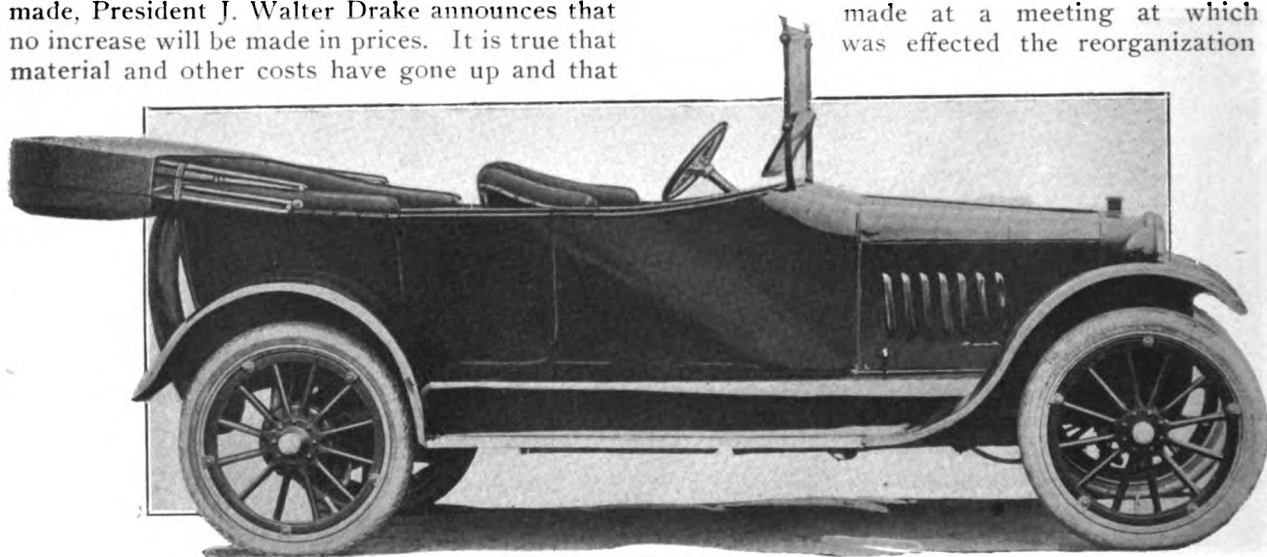
NO INCREASE IN HUPMOBILE PRICES.

Although the Hupp Motor Car Company is 2500 cars behind its orders and the prospect is that many more cars will be wanted than can be made, President J. Walter Drake announces that no increase will be made in prices. It is true that material and other costs have gone up and that

the auspices of the N. A. C. C. The permanent committee of the association has been formed as follows: Papers committee, O. W. Williams, Interstate, chairman; R. J. Ellston, Westcott, and W. E. Conover, Premier; membership committee, J. O. Myers, National, chairman; H. R. Perry, Haynes; F. R. Seeds, Lexington-Howard; social committee, E. T. Klee, chairman; C. W. Swain, Empire; E. W. Cotton, McFarlan.

CLEVELAND SHOW ARRANGED.

The 15th annual Cleveland (O.) automobile show will be held Jan. 8 to 15, at the Wigmore Coliseum. Dates were chosen and arrangements made at a meeting at which was effected the reorganization



The New Series Saxon Six-Cylinder, Five-Passenger, Touring Car, Which Sells for \$785 and Has Many Improvements for 1916.

the full output could be sold at a price from \$150 to \$200 higher President Drake declares, but the company prefers to maintain the prices that were at first announced.

INDIANA SERVICE MANAGERS MEET.

As a result of a preliminary organization meeting of the Indiana Automobile Service Managers' Association, held in Indianapolis, Aug. 7, the first of the three regular annual meetings of the organization will take place at the Severin hotel at 3 o'clock Saturday, Oct. 9. There will be an address by H. W. Drew, president of the Nordyke & Marmon Company, on the subject of the association, which will be followed by four talks by members reviewing the Service Managers' convention recently held in Detroit under

of the Cleveland Automobile Show Company, the dealers' organization which gives the show under a sanction from the Cleveland Automobile Club.

The new officers and directors are: President, A. R. Davis, the A. R. Davis Motor Company; first vice president, Walter C. White, the White company; secretary, T. H. Towell, the Cleveland Cadillac Company; treasurer, G. G. G. Peckham, the Ohio Buick Company; H. O. Secrest, the Anderson Electric Car Company; M. L. Bridgeman, the Overland Cleveland Company; George Kelley, the Baker-R & L Company, and Joseph H. Greenwald.

Fred H. Caley, who has managed the show for the last four years, will be in charge again this year. The show immediately follows that in New York and comes a week earlier than the Chicago show.

THE THEORY OF THE TWIN SIX.

J. G. Vincent, Vice-President of the Packard Company, Explains Why He Adopted the Design for the Twin Six for 1916.

BEFORE a meeting of the Detroit section of the Society of Automobile Engineers, J. G. Vincent recently detailed the reasoning which had caused the Packard Motor Car Company to adopt the Twin-Six motor in preference to the single six and the eight.

Before the Twin-Six was decided on an effort had been made to improve the single six Packard motor of last year by reducing the weight of the reciprocating parts and increasing the compression. This yielded a more efficient engine and greater power, but the motor was rougher and it vibrated more. This was a result that the company did not approve.

To secure increased efficiency, as well as greater smoothness of operation, it then turned to V principle design. A motor was desired of about the same total cubic piston displacement, which in the single six was 414.7 inches. An eight-cylinder motor of substantially that size would have had cylinders of $3\frac{7}{16}$ -inch bore and $5\frac{3}{4}$ -inch stroke and a piston displacement of 424 inches.

So far as the character of the torque is concerned such a motor would have been 50 per cent. better than the single six because of the increased frequency of the explosions. It would also have been somewhat lighter.

The crank case and crankshaft would have been shorter. The crankshaft could also be made lighter because of its shorter length and because the weight of the pistons and connecting rods would be less, owing to the smaller size of the cylinders.

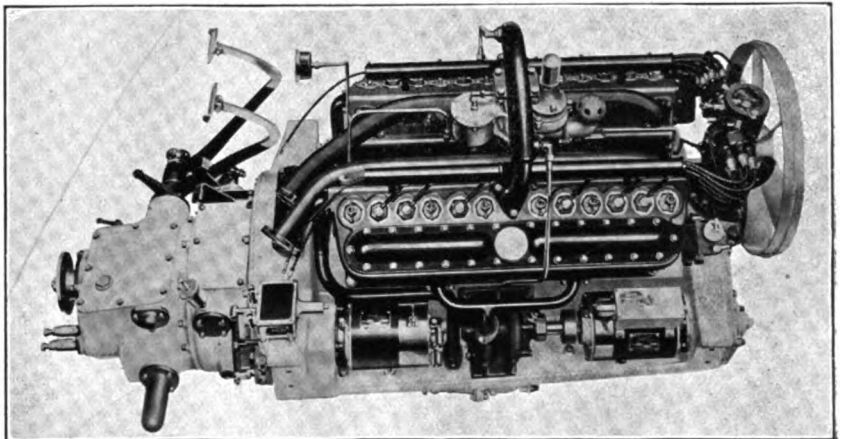
Eight-Cylinder Vibration.

In smoothness of operation the eight would have been better than the six at low speeds, because of the more even torque. At high speeds the engine would show more vibration than the six because of the nature of unbalanced inertia forces, which Mr. Vincent explained later in greater detail. This vibration was considered undesirable since the chief purpose of a new de-

sign was to obtain a motor that would operate smoothly at all speeds.

So far as accessibility is concerned, the eight is at a great disadvantage as compared to the single six. It is necessary to set the two blocks of cylinders opposite each other at an angle of 90 degrees, owing to the fact that there are four power impulses to each revolution of the crank shaft, which brings them 90 degrees apart.

The 90-degree angle produces a wide motor, so that it is necessary to mount the carburetor and other accessories either under the engine—which is impractical because they will become very dirty and are susceptible to damage—or between the blocks, which would fill that space so

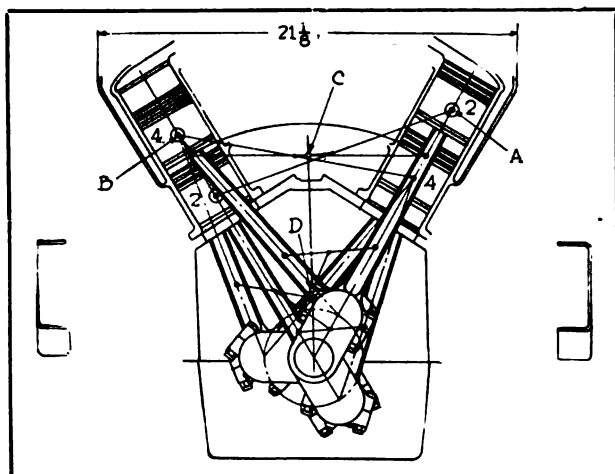


View of the Packard Twin-Six Motor Taken from Above to Show Valve Alley Between the Two Blocks of Six Cylinders Each.

that the valves would be inaccessible. The wide angle of the engine also made difficult designing a steering gear that could be assembled easily. In most eights it is necessary to take off the body and partially dismount the engine to take out the steering gear.

The wider engine also requires a frame wider in front, necessitating a longer turning radius for the car, since the wheels cannot be cramped so sharply. The shorter wheelbase made possible by the shorter engine does not make up the difference, since an inch added to the frame width will more than offset a reduction of three or four inches in wheelbase length.

A single four-cylinder motor is not in balance.



Partial Cross Section of the Twin-Six Motor of Three-Inch Bore by Five-Inch Stroke, with a Total Piston Displacement of 424 Cubic Inches.

As the pistons move up and down the centre of gravity of all the pistons taken together moves up and down and at high speeds this produces a vertical vibration. In the double four or eight the movement of the center of gravity of all the pistons in either block offsets the similar movement in the other block and the vertical vibration is eliminated.

But owing to the cylinders being set at an angle a horizontal vibration is set up and the centre of gravity of both sets of moving parts jumps from side to side with the movement of the pistons.

Now the single six engine is in complete theoretical and practical balance and the vertical vibration is not set up at any speed. This is equally true of the Twin Six—the centre of gravity of all moving parts remaining at the same point whatever the position of the pistons.

In other words, the Packard engineers felt that the double four brought back into the design some of the short comings of the single four which the six had been designed to overcome. These could be removed again by building a double six.

In designing the Twin-Six motor, furthermore, the cylinders must be set against each other at an angle of 60 degrees instead of 90. This is due to the fact that there are six power impulses to every turn of the crankshaft and the 360 degrees of the circle divided by six brings a new impulse every 60 degrees. This results, of course, in a narrower motor.

Characteristics of Twin-Six.

The characteristics of the Twin-Six as compared to the Twin-Four, were found to be as follows: The torque is 50 per cent. better than

the Twin-Four and 100 per cent. better than the single six. The six impulses per revolution blend together so closely that the action resembles a steam turbine.

So far as weight is concerned, it is almost the same for the Twin-Six as for the Twin-Four, but the engine is lighter than the single six. It is slightly longer than the Twin-Four, but owing to its smaller bore and stroke and lesser angle, it makes up by lack of width what it loses in greater length. The weighing of actual motors has proved this.

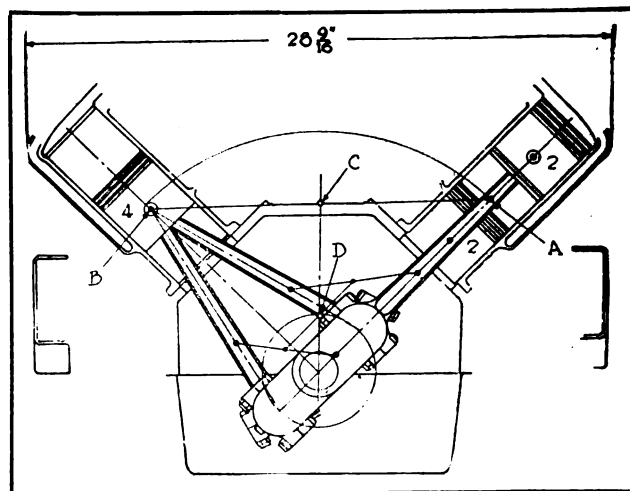
In regard to accessibility, it is better than the eight and equal to the six. The motor is narrow enough to permit the usual accessories to be placed alongside it, except the carburetor, which is mounted very high between the blocks, where it does not interfere with access to the valves. The narrower angle makes it possible to build a 424 cubic inch motor 21 1/8 inches wide, as compared to 28 9/16 inches for the eight. There is no difficulty in assembling or disassembling a properly designed steering gear.

Greater Turning Radius.

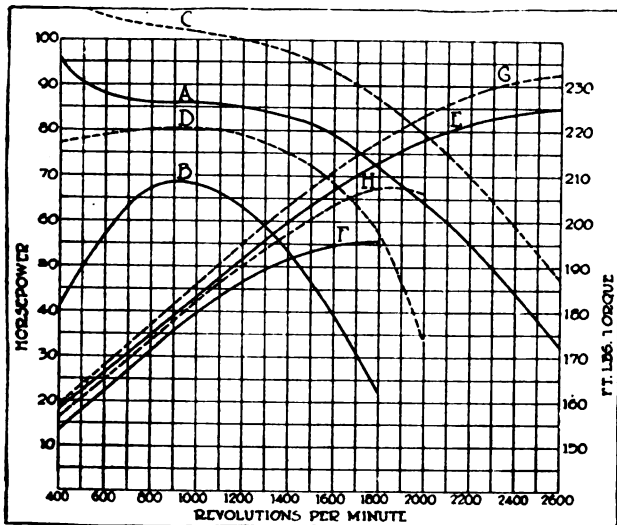
With regard to turning radius, the Twin-Six is better than the Twin-Four and slightly better than the single six. It assembles into a frame of the same width as the single six and there is, owing to the smaller width of the cylinders, a substantial reduction in the wheelbase.

There is a tremendous difference in the power output of the various motor types at different speeds, due partly to increased compression, partly to more effective valve area, but largely to the lightness of the reciprocating parts and the consequent reduction in friction.

Both the Packard single six and Twin-Six



Partial Cross Section of a Twin-Four Motor of 3 7/16-Inch Bore by 5 3/4-Inch Stroke, or a Total Piston Displacement of 424 Cubic Inches.



Scale Showing Actual Horsepower Output of a Packard 3-38 Six of 415 Cubic Inches and a Packard Twin-Six of 424 Cubic Inches.

motors are equipped with valves whose diameter in the clear is half the bore, but in the single six a lift of $\frac{3}{8}$ of an inch is required, while the Twin-Six with $\frac{5}{16}$ lift has an opening approximately 22 per cent. greater in proportion. This is due to the fact that the piston area decreases with the square of the diameter, while the effective valve opening decreases directly with the area.

The Twin-Six motor turns smoothly and safely at 3000 revolutions a minute, but its excellent torque at slow speeds makes it practical to keep its speed down to a point only a little greater than that of the slow speed motors. Therefore, a greater gear reduction than that used with the single six has been employed.

Whereas, as Mr. Vincent explained, the single six could be driven 25 miles an hour at 900 revolutions a minute, the Twin-Six is driven 23.5 miles at the same engine speed. At 70 miles an hour the new motor is turned at 2700 revolutions per minute.

High Speeds Are Safe.

While the engines are not run at high speeds, Mr. Vincent declares that they can be run up to 3000 revolutions a minute much more safely than the single six design could be run at considerably lower speeds.

Owing to the smaller cylinders and reciprocating and rotating parts, the bearing pressures, which determine the speed at which an engine can be run safely, are much lower in the Twin-Six than in the single six. The following table gives the figures for the Packard single six, the

Twin-Six and the special high efficiency six which has already been mentioned:

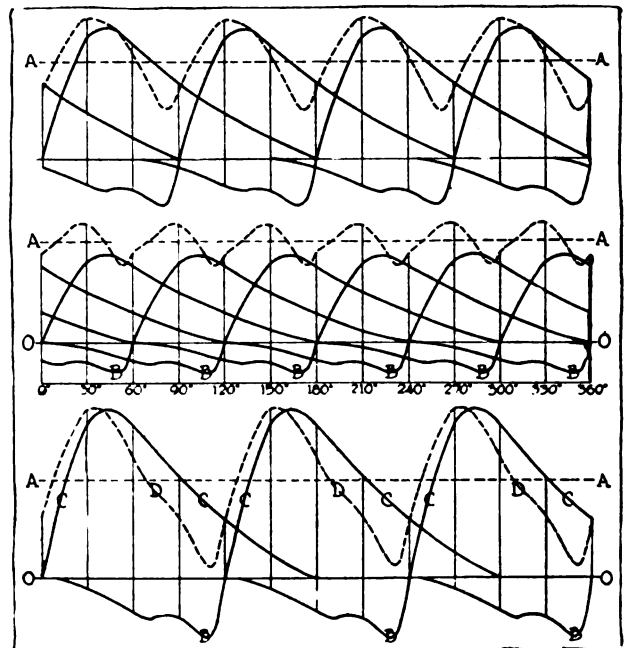
	338 Six, Lb.	Special 338 Six, Lb.	Twin Six Lb.
Piston assembly, complete with rings, piston pin and set screw.....	4.125	2.11	0.814
Connecting rod, upper end.....	1.38	.828	.625
Connecting rod, lower end.....	3.31	2.421	1.52

The following table gives a comparison of forces due to gas pressure and inertia at 2000 revolutions per minute of the same motors:

	Lb.	Lb.	Lb.
Inertia of one piston assembly complete	2130	1140	492
Centrifugal forces of one connecting rod, lower end.....	1030	754	430
Centrifugal forces of one pair of connecting rods, lower ends.....	...	...	860
Crank pin bearing pressure per square inch, due to inertia.....	768	433	379
Crank pin bearing pressure per square inch, due to gas pressure.....	916	916	871

C. C. Hinckley, chief engineer of the Chalmers Motor Car Company, called attention to the fact that in the Packard engine a two-inch crankshaft was used, which, he said, was about the same size and weight that would be found in a single six-cylinder engine of the same capacity. This was installed in connection with a vibration damper and he asked Mr. Vincent whether the vibration damper were employed to make up for the small size of the crank.

Mr. Vincent replied that in experimenting



Continuity of Torque Covering One-Half Cycle for Three Motors of 424 Cubic Inch Piston Displacement, Representing Power Impulses of a Twin-Six in the Centre Diagram and a Single Six in the Lower.

with the Twin-Six motor he had run into the same condition that has always been experienced with single six motors. At certain speeds there is a synchronized vibration due to oscillation of the crankshaft. The trouble is not affected by the Twin-Six design and periodicity will still develop in the crankshaft.

The front throw of the crankshaft is slightly displaced by the impulse due to the piston working stroke. With the added rotative weight of the Twin-Six it comes back slower than in the single six, and the result is that the pistons get "in step" with it at a lower speed, bringing on periodic vibration at a lower car speed.

This periodic vibration could have been overcome by making the crankshaft larger. That would have overcome it at lower speeds, but it would still have come into existence at higher

periodicity would be encountered, or of putting on the vibration damper. By putting on the vibration damper they were able to damp out the periodicity without making a larger crankshaft. The smaller crankshaft results in lower bearing speeds, and lighter weight and makes for efficiency. So they chose the vibration damper.

A Brake on Crankshaft Swing.

The vibration damper is simply a brake on the swing of the crankshaft. Mr. Vincent explained the principle by saying that if in an ordinary children's swing you placed a board on each side of it in light contact with the swing, and pushed on the ropes, the swing would go back to the end of its swing, but the braking effect of the boards would make it swing forward again very slowly and would probably stop it at the centre.

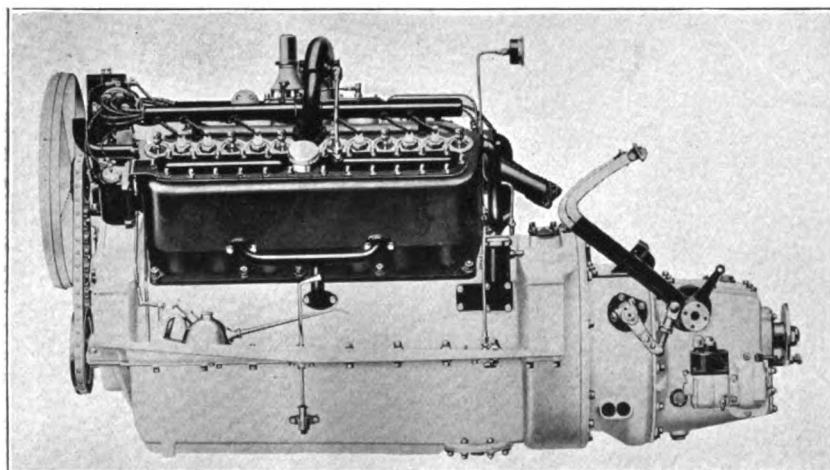
The vibration damper does not prevent the shaft from springing slightly, but it does prevent its regular oscillation and its tendency to set other parts going with it. It also tends to smooth the motor out through its entire range in addition to stopping periodic vibration.

Asked to define the terms "ability" and range of ability of a car as used in his paper, Mr. Vincent said that by "ability" or "range of ability," he meant the car's capacity for acceleration. If a car would accelerate rapidly from one to 70 miles an hour and run without vibration at any intermediate speed, he would say that it had a great range of smooth ability.

Its range of ability on various gear ratios, he said, was determined by the speed at which it would go from maximum to minimum on those gear ratios. It is a matter of acceleration, and in Packard cars it had been determined for years with acceleration charts.

These are made by starting a car at five miles an hour and accelerating it as rapidly as possible. The speedometer is read every 10 seconds and in that way a chart can be made, showing exactly the car's accelerating ability. These tests are made on good roads on the level. They are made with the car going in both directions and the average of the two taken so that the effect of wind or grade would be eliminated.

This test, he said, gave a very clear indication of what the car's hill climbing ability would



View of the Left Side of the Packard Twin-Six Motor.

speeds. It is impossible to make a crankshaft within reason as to size and still make it so strong that it will not spring a little under the impulses of the pistons. But the larger the crankshaft the faster will be its periodic vibration and the faster the pistons will have to go to get "in step" with it.

This periodic vibration is experienced only when the pistons are in time with the natural crankshaft vibrations, and the range of speed in which it is experienced does not usually extend over a range of greater than from $1\frac{1}{2}$ to three miles. If it comes in at 40 miles an hour it would go at $41\frac{1}{2}$ miles, or at the most 43 miles, but it would come in again with much increased intensity at 80 miles if it were possible to go that fast.

In designing the Packard engine the engineers had the choice of using an unusually large crankshaft and going to a very high speed before

be, as it took into consideration weight as well as time.

Twin-Six Carburetion.

A. C. Woodbury, recorder of standards for the society, said he had heard that the carburetion difficulties experienced on the Twin-Six had been very much less than those with most cars, even at very low speeds, and he asked if there were any secrets regarding design which accounted for that fact.

Mr. Vincent replied that they had indeed had very little trouble with carburetion—so little that he himself had been surprised. He said the engine had been designed very carefully and especial care had been taken to get the sizes and capacities of the manifolds, carburetor and valves strictly in line with the practise that had yielded the best results on previous Packard cars.

In designing that part of the engine, however, they had only applied the experience and knowledge which had been gained in building six-cylinder cars. The carburetor is exactly the same size as that used on the old Packard single six.

The carburetor and the parts are exactly the same, except that the inside spring of the air valve had been made softer because of the more continuous and even suction of the engine. This makes it unnecessary to shut off the air supply so sharply to prevent the mixture becoming too lean, and the spring, therefore, was reduced about one-third in stiffness.

Because the manifold is divided to go into each cylinder block, it was reduced in size from $1\frac{3}{4}$ inches to $1\frac{1}{2}$ inches. Great care was also taken to heat the gas. The header that goes into each cylinder is surrounded by warm water on three sides. As soon as the motor warms no condensation takes place between the carburetor and the cylinder.

Regarding Overhead Valves.

Mr. Vincent was asked whether he thought there was any advantage worth going after by adapting the overhead valve to the multiple cylinder type of engine. He said he thought that possibly a little more power might be secured by the overhead valve and that if he were building a racing car, where power is the only consideration, he would use that valve.

But he said the L head motor had wonderful all around efficiency when it was properly built. It is simple and almost anyone can take care of it properly. While at high speeds the valve-in-the-head undoubtedly yields a great deal more power, those speeds were not often used and no valve-in-the-head had been designed so far as he knew that would stay quiet for any length of

time. There are usually difficulties in grinding the overhead valves.

These considerations, he thought, were of more moment in the ordinary motor car than the increased power of the valve-in-the-head construction. He did not think that there would be any marked movement toward valve-in-the-head design so far as high priced cars are concerned.

INSPECTION TOUR OF DIXIE WAY.

A great inspection tour of the entire length of the Dixie highway, from Chicago to Miami, Fla., in which nearly 500 cars are expected to participate, started from Chicago, Oct. 9. The first day's run was to Danville, Ill., where a great banquet was held in celebration of the completion of the first three miles of paved road on the route in that county.

The plan was that as the cars left Chicago they were to be headed by Governor Dunne of Illinois, M. M. Allison, president of the Dixie Highway Association, and Carl G. Fisher of Indianapolis, founder of the Dixie highway movement. The number will be increased as the tour progresses. Automobile clubs along the way will get out the largest possible number of cars to meet the tourists and escort them into the various towns.

A meeting of the board of directors of the association will be held at French Lick Springs, Oct. 11. The tour is expected to reach Miami on the evening of Oct. 21.

COMING EVENTS.

October.

- Oct. 11-12—Convention National Paving Brick Manufacturers, Dayton, O.
- Oct. 14—S. A. E. Standards Committee Meeting, Chicago.
- Oct. 16-22—Show, Montreal.
- Oct. 16-23—Show, Pittsburg, Penn.
- Oct. 17—Match race, Twin City Speedway.
- Oct. 18-19—Convention Electric Vehicle Association of America.
- Oct. 18-24—Show, Troy, N. Y.
- Oct. 20-22—Meeting, National Association Automobile Accessory Jobbers, Excelsior Springs, Mo.
- Oct. 24—Race, Fort Worth, Tex.

November.

- Nov. 1-3—Show, Pasadena, Cal.
- Nov. 12-20—Show, Providence, R. I.
- Nov. 18—Race, 150-mile Grand Prix, Arizona.
- Nov. 20—Road race, Carona, Cal.
- Nov. 29-Dec. 4—Electric Prosperity Week.

January.

- Jan. 1-8—Show, New York City.
- Jan. 8-15—Show, Philadelphia.
- Jan. 8-15—Show, Cleveland, O.
- Jan. 22-29—Show, Chicago.
- Jan. 24-29—Show, Buffalo.
- Jan. 29-Feb. 5—Show, Minneapolis, Minn.

February.

- Feb. 7-12—Show, Kansas City, Mo.
- Feb. 15-20—Show, Omaha, Neb.
- Feb. 19—Show, Newark, N. J.

March.

- March 4-11—Truck show, Boston, Mass.

INDUSTRIAL HAPPENINGS AND COMMENT.

THE Inter-State Motor Company, Muncie, Ind., has broken ground for a three-story addition, 80 by 150 feet, to building No. 2. It will be of brick and steel and, giving 36,000 square feet of floor space, will make the total space available in the entire plant approximately 200,000 square feet. In addition to this there is being built a "building within a building," which includes a main structure, 160 by 440 feet, and within this area there is to be another measuring 34 by 230 feet. This design is expected to greatly facilitate handling and manufacturing methods.

The Westinghouse Electric and Manufacturing Company, Pittsburgh, announced after a conference with a grievance committee of the workmen that instead of an average 54-hour week it will be inaugurated an average 52-hour week. In addition, the company for the next calendar year, beginning Sept. 1, 1915, will grant a bonus to all shop employees of six per cent. on the earned wages.

The New Departure Manufacturing Company, Bristol, Conn., maker of New Departure ball bearings, announces extensive additions to its big 10-acre plant and the installation of machinery that will double its present production facilities. One of these additions will be the

The Prest-O-Lite Company, Indianapolis, is spending about \$60,000 for a new storage battery plant of 45,000 square feet floor space, and \$25,000 for additional machinery to install therein. This represents an increase of floor space of 33 1/3 per cent. The new plant will be ready for occupancy about Dec. 1, and in the meantime the company is building about 400 batteries per day in the Murphy building. The company is also installing storage battery service stations at all its branches, 20 of which have already been equipped.

The Hyatt Roller Bearing Company will construct a warehouse in Detroit which will be the distributing plant for its automobile and tractor divisions. It will be of modern concrete construction, two stories high, containing 20,000 square feet, and located on the Michigan Central railroad. It is planned to have a daily delivery of a car load of bearings to the warehouse to facilitate deliveries to manufacturers. An adequate stock of the popular sizes will be kept on hand for instant shipment.

The Kissel Motor Car Company, Hartford, Wis., is planning to double its production of KisselKars by erecting three new additions to its plant. One will be a modern four-story office building for all executive and clerical forces. The second is a 100 by 35 foot structure, to be used for storage and shipping, and the third, measuring 110 by 35 feet, will be for the enamelling department.

The Hudson Motor Car Company is understood to be suing the Michigan Central Railroad Company for \$527 in freight charges, paid on two automobiles which the railroad undertook to deliver in Monterey, Mex., but was prevented by the embargo due to revolutionary conditions there.

The Firestone Tire and Rubber Company, Akron, announced at the recent annual convention of its 300 branch managers and district salesmen that the output of the factory would be increased soon from 7000 to 12,000 tires a day.

The Willlys-Overland Company is shipping cars from its Toledo plant at the rate of 650

cars a day, which is considerably in excess of the 600 mark set for production this fall. The high mark for a single day was 655 cars.

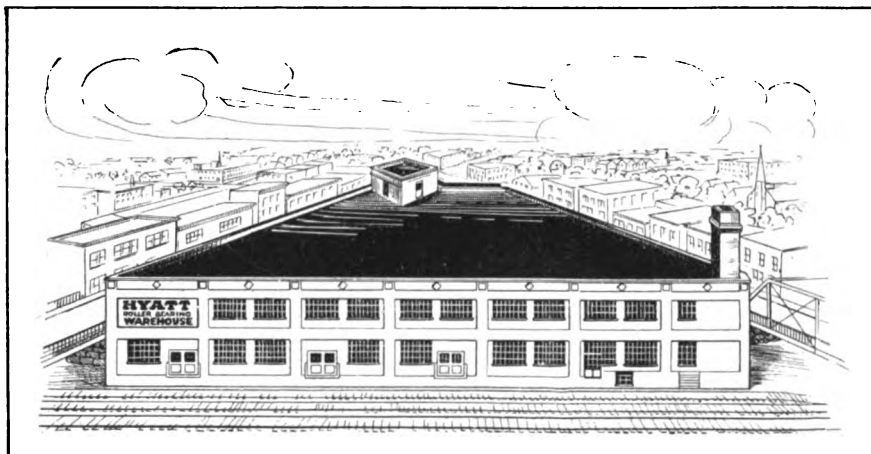
The Standard Oil Company has begun suits against New Jersey garage men who are said to have claimed that they furnished Standard Oil gasoline to motorists, when as a matter of fact the gasoline they sold was made by some other refiner. This is in line with the company's recent adoption of a trade mark, Socony, for its gasoline, and the use of advertising to make it known the world over.

The General Motors Company, through officials, has denied that negotiations are under way leading toward the acquisition of the Peerless Motor Car Company. A report to that effect was widely circulated in financial circles recently.

The Studebaker Corporation recently bought the hollow tile building of an ice company in Detroit, which adjoins the Studebaker plant No. 3, and is to tear it down and erect a large building more suitable to automobile manufacture. Negotiations for additional property in that district are under way, as are plans for extensive additions to the buildings of the plant. Vice President Ollier announces that these alterations are intended to provide for the great demand being felt for Studebaker 1916 models, more than 75,000 having already been contracted for.

The Knox Motor Company, Springfield, Mass., has adopted the eight-hour day for its 400 machinists.

The Willlys-Overland Company's old wooden office buildings will be abandoned for a magnificent seven-story administration building.



Architect's Plan for the New Hyatt Roller Bearing Warehouse in Detroit.

largest building specially designed and equipped for grinding purposes in the world, and will contain some specially made machinery. Another addition will be a heat-treating plant, which will contain 230 special oil fired furnaces and many unusual features. Though these extensions are influenced somewhat at this time by the fact that foreign made ball bearings have been cut off by the European war, the company maintains that the greater influence comes from the increased domestic demand, which is certain to be permanent because "American Made for American Trade" ball bearings are equal in quality to the best of the foreign made.

The Russell Motor Company of Canada is expected to hold its annual meeting in Toronto during the latter part of October and then to present the long deferred statement of the affairs of the company.

The King Motor Car Company, Detroit, is compelled by the great demand for its eight-cylinder model to increase its plant, and has taken possession of a four-story building at 1045 East Jefferson avenue, which will provide 68,400 square feet of floor space. In addition to the other King plant at 1300 East Jefferson. The new plant will be devoted exclusively to manufacturing.

The Remington Motor Company has purchased at Kingston, N. Y., the large plant generally known as the Vaughn Motor Car Company, but formerly the Peckham Car Wheel Company's factory for a number of years. The Vaughn company bought it two years ago and remodelled it with the idea of manufacturing its cars there, but later placed it in brokers hands for sale. The buildings are of one-story brick construction and are modern in every respect.

SUGGESTIONS FOR THE FORD CAR OWNER.

How the Oil Is Circulated and the Available Supply—Need of a Good Lubricant— Effects of Temperature and the Results When Lubrication Is Deficient.

The 33rd article dealing with the construction, operation, maintenance, care and repair of the model T Ford chassis is devoted to further consideration of the lubricating system for the engine and to essentials that govern sufficient lubricity.

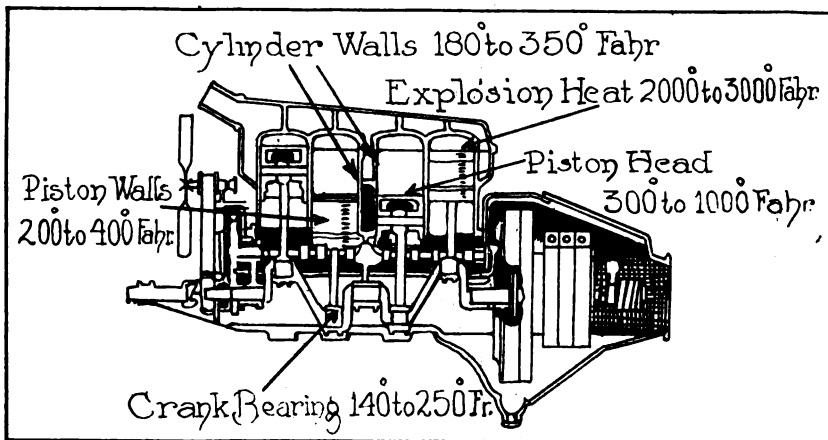
THE oil as it is carried from the reservoir by the centrifugal movement of the flywheel in large volume is thoroughly distributed about the interior of the housing of the flywheel and the transmission gearset. Where the lubricant is thrown off in considerable volume it flows into the funnel, which is about $1\frac{1}{2}$ inches diameter, and is carried forward by gravity, but the oil is practically broken into a spray outside of the stream that reaches the funnel. That part of the oil that is not taken by the funnel drains back into the reservoir to be again carried upward by the flywheel.

When the crank case is filled to the level of the highest drain cock the volume of oil circulated will be greatest, and with the engine turning 1500 revolutions a minute the circulation will be approximately at the rate of perhaps two quarts a minute, but it may exceed this rate. As the oil is consumed and the level is lowered the volume of oil circulated will considerably decrease, probably to less than half the maximum of two quarts, and when below the lower drain cock the circulation lessens rapidly. Of course there are other conditions that influence the efficiency of the system, the character of the oil—for a heavier lubricant will not be as thoroughly distributed, and a lighter oil will not be carried in as large a volume—the heat of the engine, the temperature of the air, all being factors that must be regarded.

Full Splash Lubricates the Engine.

As the oil is carried forward in the tube it floods the timing gears and then flows into the bottom of the crank case and over the forward end of the oil ring, filling the pool beneath the connecting rods. The connecting rods, when the

pistons are at bottom centre, dip into the oil approximately a half inch, the crankshaft setting being so that the lugs or webs on the caps will sweep $\frac{3}{16}$ -inch into the troughs. This is with the oil ring containing the full capacity. In recently built chassis openings are made in the sides of the oil ring, varying from $\frac{1}{16}$ to $\frac{1}{8}$ inch, to reduce the depth of the oil beneath the connecting rods, but obviously the flowage through these openings is dependent upon the heat of the engine, the grade and viscosity of the oil, and the volume supplied. As the openings are not uniform in width, one cannot determine what will be the actual oil depth in the troughs in any given operating condition.



The Great Variance of Temperature in an Engine and the Reasons for Using a High-Grade Lubricant.

The oil thrown off by the revolving big ends of the connecting rods lubricates the centre and rear main bearings, the camshaft bearings, the wristpins, cylinders, pistons, cams and valve tappets. In the illustration these are thus designated: D, oil troughs; E, connecting rods; F, oil pockets for main bearings; G, main bearings; H, crankpin bearings; I, cylinders; K, pistons; L, wristpins; N, piston rings; O, camshaft oil pockets.

One Quart Supply Available.

The owner is instructed that the best results are when the oil level is midway between the two crank case drain cocks. The volume represented

by the reservoir capacity between the two cocks is approximately a quart, and this is what may be regarded as the quantity available for consumption, but the remaining three quarts in the crank case serves to cool the oil that is heated from contact with the pistons and cylinders and the whole does not deteriorate from various causes as quickly as a smaller quantity.

A large supply of oil in the reservoir is practical insurance against wear and beyond this it unquestionably has marked cooling influence that is little understood or realized by the average motorist. The reader has been informed that the lubricant is carried forward from the reservoir through the funnel and tube to the timing gears and thence drains into the oil ring and after serving for splash lubrication of the engine it flows into the reservoir, again to be circulated.

Theory of Best Lubrication.

Theoretically, the best lubricity obtains from applying very small quantities to the contacting surfaces and renewing this as frequently as is necessary to maintain an efficient standard, but this is neither practical nor possible with motor vehicle construction, and so a system has been designed that will, with ordinary attention, be sufficient to meet all requirements of average service.

In this connection emphasis may be made that the Ford chassis is not designed for racing nor for enduring excessive stresses. It is intended for use where other vehicles are usually driven and at speed consistent with conditions. When the service required is normal, that is, the machine is not worked to its greatest capacity at all times, the system is adequate, and because of one supply serving for the engine, the clutch and the gearset, it has the additional advantage of simplicity that is particularly commendable.

How Supply Is Diminished.

Assuming that the crank case is filled to the highest level, when the engine is started the flywheel begins to supply lubricant to the funnel and the big ends of the connecting rods throw the oil about the interior of the engine, and this lowers the height somewhat in the reservoir. The flywheel will carry the oil to the timing gears, so that these are constantly flooded and the excess drains back into the oil ring and troughs, the volume increasing with the speed of the engine, but as the speed is increased the quantity that is distributed all over the interior of the engine is greater than at slow speed and the level is lowered in the reservoir.

Time is required for the drainage of the oil, which is by gravity only, and this is influenced

by the temperature of the engine, the quality of the lubricant and the condition of the machine.

Oil Film Between Surfaces.

The oil used for lubricating purposes is intended to first form a film between two moving surfaces, and by preventing actual contact of the parts it minimizes friction. There is a quality of oil that will best serve this purpose, and the oil will remain between the surfaces so long as its body or volume is not reduced or changed by temperature or the accumulation of minute particles of metal or other substances. Oils used for engine lubrication should be of mineral derivation because these do not naturally contain acids nor are acids created by decomposition. All internal combustion engine oils are hydro-carbons in that they are constituted of the elements carbon and hydrogen in differing proportions, and each has its own physical characteristics.

American motor oils are manufactured by refining crude petroleum, which have as bases paraffin, asphalt, or a mixture of paraffin and asphalt, and the preparation is by steam or vacuum distillation, or dry or destructive distillation. After distillation the refining is carried further by purifying by what are known as the sulphuric acid or filtration processes, the former classification containing certain hydrocarbon sodium "sulpho" salts, varying in quantity with the quality, and the latter because of filtration through "fuller's" earth, containing no acid. Obviously the oils that contain no "sulpho" salts will be free from sulphuric acid in any form and are the better suited for lubrication, for at high temperatures the salts are converted into free sulphuric acid, which will have a destructive influence upon metal, causing "pitting" and roughening of the surfaces it contacts with.

The Quality of Viscosity.

The fluidity of oil is a quality known as viscosity, which is measured by the time required for a given volume at a given pressure to pass through a standard aperture, and this is expressed in seconds, the readings being usually made at 100 and 212 degrees of temperature Fahrenheit. The range is from 180 seconds for a light or medium oil to 2300 seconds for an extremely heavy oil, as usually applied to internal combustion engines. Oils of less than 180 seconds viscosity are not satisfactory because they have not sufficient body to lubricate sufficiently, and those of more than 800 seconds viscosity are unsatisfactory because fuel consumption is increased. Maximum results have been found by laboratory tests to be with oil having 180 seconds viscosity, which affords greatest horsepower production for the fuel

consumed, and as the viscosity increases from 180 seconds the fuel consumption increases uniformly with it.

Between 800 and 2300 seconds viscosity there is comparatively little variation in the volume of oil consumed, which is regarded as indicating that there is nothing gained by using an oil heavier than 800 seconds viscosity, and that between 300 and 800 seconds viscosity the greatest economy of both fuel and oil consumption is obtained, together with the greatest horsepower production. Laboratory and service tests have demonstrated this fact, and that results are dependent upon the condition of the motors and their average operating temperatures. Were it not for a more rapid carbonization (when heavy oils are used), no oil of less than 300 viscosity would be recommended, in the light of these facts. But a practical condition must be sought, and for that reason light and medium oils, having viscosity of from 180 to 300 seconds, are regarded as the best suited for the widely differing service conditions.

All internal combustion engine oils, when heated, lose viscosity and become more fluid, and the rate of this loss, with rise in temperature, is not uniform and is not comparatively between oils of very light and very heavy body. In operation the lubricating oils are exposed continuously to high temperatures, this being especially true within the explosion chambers and upon upper surfaces of the cylinder walls and lower surfaces of piston heads.

When a sample of fresh oil is dissipated by boiling a black layer of carbon will be deposited, which is known as residual carbon. This will vary in volume from a trace with highly filtered oils to a substantial incrustation with inferior oils. No oil is produced from which a carbon deposit cannot be obtained when exposed to high temperatures, the volume depending largely upon the grade of crude oil and the method of refining.

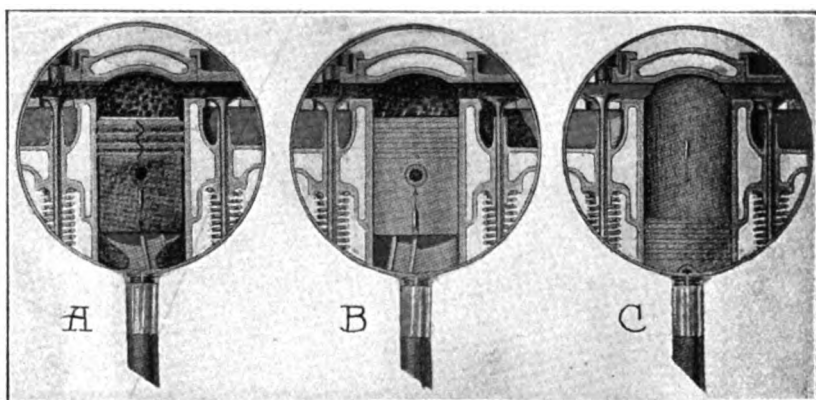
Effect of Heat on Oil Film.

Oil for the lubrication of the pistons and cylinders is splashed on the lower cylinder walls and is carried upward and spread over the cylinder wall to the height of the piston stroke by the pistons and piston rings. A certain quantity is thrown off the pistons by the upward strokes and is projected onto the walls of the combustion chambers. If the quantity thrown off is small

and the fuel is "lean" and is consumed rapidly, this oil will be practically all burned by the explosion and there will be no appreciable deposit of carbon. But when the quantity is large and the heat of the explosion does not consume it as readily the vaporized portion is exhausted with the gases as smoke and the remainder is left on the walls as the heavy end-products of destructive distillation. These are reduced by the intense heat into a cumulative incrustation that is generally referred to as carbon deposits.

What Forms "Carbon" Deposits.

The actual free carbon content of this so-called carbon deposit may vary from less than one per cent. to as high as 75 per cent., and the other constituents will be metal oxides (mostly iron) from a mere trace to perhaps five per cent., a considerable volume of earthy matter that is resultant from the road dust drawn into the engine through the carburetor with the fuel gas, and



Some Effects of Poor Lubrication: A, Escaping Gas Causes Low Compression; B, Preignition from Incandescent Carbon; C, Scored Cylinders and Excessive Friction and Lost Power.

various solid black carbonaceous or asphaltic compounds from the oil, varying with the lubricant used. An analysis of crank case sediment, taken from an engine operated in a laboratory, showed less than two per cent. of free carbon, metal dust of less than one per cent., and equal volumes of carbonaceous matter, and an analysis of a deposit on the inside of a piston showed approximately the same percentages of constituents, with a slight increase in free carbon.

The systems of lubrication adapted for internal combustion engines all provide a very liberal distribution of oil in the crank case below the pistons. The splash, or centrifugal discharge from any other system, will fill the engine with a spray or mist of oil that is drained into the reservoir, so that, unless the splash troughs or pools are not fully supplied, there ought to be sufficient

lubrication for the moving parts. This is true of the Ford engine, and even with the level very low in the reservoir there ought to be full height in the pool within the ring and in the troughs.

Effect of Temperature on Oil.

This is all very well if the engine has not been worked to capacity for a considerable period, or at least until it is what is known as "hot." In such an event the greater quantity of oil is necessary, because the volume consumed is proportionately more, and to meet the needs for thorough and effective lubrication there should be a greater quantity supplied for each revolution, when in reality there is never more than the normal level, and perhaps less. The fluidity of the oil will increase with the rise in temperature, and the heat in the combustion chamber and expansion chamber may be 3000 degrees Fahrenheit, or more in some conditions; the piston heads from 300 to 1000 degrees Fahrenheit, the piston walls from 200 to 240 degrees Fahrenheit, the cylinder walls from 180 to 350 degrees Fahrenheit, and the crankshaft bearings from 140 to 250 degrees Fahrenheit.

The oil to lubricate the engine must at least have lubricity at the extreme temperatures, and its viscosity should not be so much reduced that frictional heat will be excessive, while it must also serve equally well at the lower temperatures. In the combustion and expansion chambers of the cylinder what is known as destructive distillation must result—that is, the oil must either be completely consumed, and residual carbon deposited in small volume on the surface, or it must, if an inferior grade of oil, be united with earthy matter and eventually reduced to a thicker and heavier deposit.

Effects in the Crank Case.

In the engine beneath the cylinders there will be chemical changes, resultant from the variations of temperature, and while not so marked, will result in carbon deposits on the interiors of the pistons, and in deposits of sediment. These will usually be in ratio to the quality of the oil. The deposits of carbon in the pistons are not of material consequence so far as influencing operation is concerned, but the accumulations in the oil, carbon, metal and particles of foreign matter, will probably be in part in suspension and will be carried to moving surfaces and, if abrasive, be more or less damaging. Undoubtedly the oil ought to be as free from impurities as is possible, for one will realize that the metal particles will result from wear and dust will be drawn in through the fuel intake, aside from what substances may be present in the oil or developed

from chemical changes. Any oil will deposit sediment, but with rare exceptions this may be said to be in ratio to quality, and the volume of the deposit may be regarded as a reasonably safe measure for determining lubricating value.

Effects in the Combustion Chamber.

The deposits of carbon in the combustion chamber, on the valves and seats, the spark plugs and the piston heads, are of much greater consequence, and while burning a mixture of fuel that will so far as possible insure complete combustion and thorough scavenging of the cylinders, will undoubtedly have some influence, carbonization will eventually result. Yet the use of a thoroughly good oil will greatly lengthen the period of service between removals of carbon—in fact, one might say that a cleaning once a year would be sufficient for an engine unless driven very large mileage. Sooted spark plugs, necessitating frequent cleaning and causing faulty ignition and loss of power; carbonized valves and valve ports, followed by leakage, loss of compression, dilution of fuel and excessive fuel consumption; preignition from the points of the carbon becoming incandescent, are some of the results that are certain to obtain.

How Oil "Seals" a Piston.

The cylinders of an engine are usually bored to have the same diameter the entire length. The pistons are generally turned to have slightly smaller diameter at the top or head to allow for the expansion. The cylinder walls will be kept reasonably cool by the circulation of water, but the pistons are cooled only by the admission of cool fuel into the cylinders and by the splash of oil into them. The clearance, the space allowed between the walls of the pistons and the cylinders, is filled by the piston rings, which are formed to be slightly larger than the cylinders and are compressed into the ring channels. If the cylinders are true and the piston rings fit perfectly, the latter prevent the escape of gas during the compression and the expansion strokes, the film of oil between the rings and the cylinder walls forming what is known as a "seal." The lubricant that best serves is that which affords the most perfect seal and the greatest degree of lubricity.

Rapid carbonization of a combustion head and piston head invariably results from a poor quality of oil, there is inadequate sealing qualities and leakage, and the complications that have been stated. The same effects could obtain from an oil of too great or too little viscosity, or from too high an oil level in the splash pools or troughs.

In the illustration A represents a mechanical defect, which probably contributes more to carbonization than any other cause—piston ring leakage. This destroys the oil seal between the pistons and the cylinders, causing loss of compression and power. An excess of oil is drawn into the cylinders at each suction stroke and the gases escape into the crank case during the expansion strokes. Not only this, the accumulation of carbon on the walls of the combustion chambers reduces the volume it would normally contain and increases the compression pressure. The low conductivity of the carbon which is probably heated to incandescence, reduces the cooling influence of the water circulation, and the gas under compression may be ignited before the piston reaches top centre, causing "knocking," which will result in damage to both the connecting rod and main bearings. The volume of the combustion chamber can be determined by the use of compression gauges or examination of the valve caps, which will show the thickness of the carbon deposit. The effect of incandescent carbon deposits is shown at B.

The use of too light an oil will often cause carbon deposits and heavy white smoke will be emitted from the exhaust. Much more oil will be consumed than if a lubricant of sufficient body were used, and more is supplied. Because it is not as heavy as the service requires the oil is drawn by the piston into the combustion chamber, and there are the compression losses resultant from the poor seal. Should the supply of oil be reduced to minimize carbonization, insufficient lubrication will possibly result in scoring of the cylinder walls. This is illustrated at C.

The quality of oil used should be the best obtainable, for it is the most economical because a less quantity is required, the lubrication is positive, the periods between removal of carbon are longest and the expense for repair work is smallest. There is no saving by using a poor oil. With sufficient lubricity a bearing may remain efficient for along time, but without adequate oiling much damage can result to it in a very few minutes.

(To Be Continued.)

SOUTHERN COMMERCIAL CONGRESS.

The Southern Commercial Congress, which encourages the construction of good roads along with other activities intended to improve the prosperity of that section, will meet at Charleston, S. C., Dec. 13-17, this year. Every line of activity in the South will be well represented.

RAILROAD PASSENGERS FEWER.

Railroad reports from all parts of the country show a marked falling off in passenger traffic during the past year. Much of this is, no doubt, due to the dull business of a large part of the year, but there is a tendency for the railroads to blame much of it upon the motor car.

The expenditure of \$2,250,000,000 for motor cars during the past few years is said to have affected every line of business in the country adversely. People have had no money to travel by train or do other things that might have been done had there been no automobiles. Thousands of tourists now go by motor car instead of by train. Commercial travellers increasingly travel by motor, saving time and taking their sample cases right with them in a convenient way.

Although New England summer and shore resorts did a bigger business this summer than ever before, the passenger receipts of the New Haven railroad fell off and this is attributed directly to the motor car. Failing passenger receipts from this cause are expected to increase rather than stop.

INSTALLMENT PLAN FOR ELECTRICS.

In addition to adopting the battery rental system in the metropolitan territory about New York City, the Ward Electric Company has worked out an installment selling scheme. At the same time Edison batteries have been substituted for the lead batteries formerly used. With the battery the price of the car has been raised from \$875 to \$1375. But it is sold without a battery for \$875. This price includes one year's battery rental. After that the rental is paid for at the rate of \$10.50 per month, including current for 600 miles. Special garages opened about the city care for the cars at \$10 a month.

BOOKLET FOR ASTOR CUP RACE.

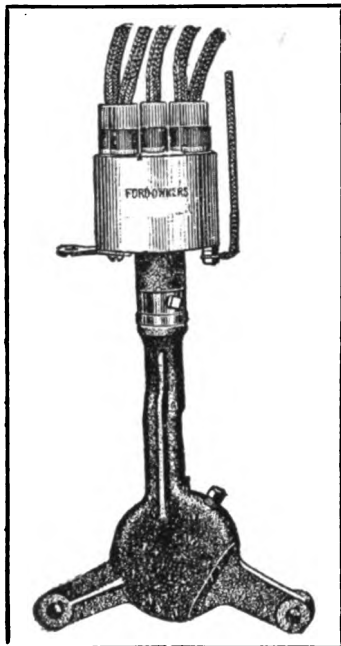
The Joseph Dixon Crucible Company of Jersey City has issued a special booklet of which 10,000 copies were distributed at the Vincent Astor cup race. The booklet is called "Words of Wisdom from the Speed Kings." In it there are 44 pictures of the well known racing drivers, with quotations from them regarding the usefulness of Dixon's graphite automobile lubricant. Copies of the booklet may be had by request of the Joseph Dixon Crucible Company, Jersey City, N. J.

FORD CAR ACCESSORIES AND EQUIPMENT.

FORD OWNERS MONO-COIL.

High Efficiency Ignition System Designed to Eliminate a Large Percentage of Ignition Faults.

Loss of power and speed, waste of gasoline and oil, poor engine control, difficulty in starting, excessive demand upon batteries, accumulation of carbon, overheating and steaming and excessive wear of the crankshaft bearings are some of the troubles due to faulty ignition on Ford cars that the Peerless Motor Specialty Company, 2 Columbus circle, New York City, claims can be overcome or minimized by the adoption of its mono-coil.



Ford Owners Mono-Coil.

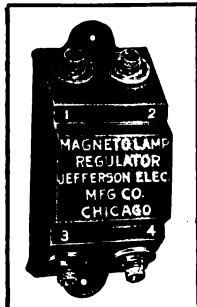
As the name suggests, the mono-coil, which is shown in the accompanying illustration, uses only one of the coil units and saves the other three against the time that the first coil may fail to work. An advantage of this system is that it requires but one adjustment as against the four necessary on the ordinary system. In this way the current to all four cylinders is maintained uniformly, and there is discharged four sparks of the same duration as the commutator in good condition.

The mono-coil is simply but strongly constructed and has no delicate parts to get out of order. The Peerless company supplies everything required for attaching, so that even the non-mechanical car owner can easily install the system in a very short time. The complete equipment, accompanied by comprehensive instructions for installation, is retailed at \$12.

MAGNETO LAMP REGULATOR.

Auto Transformer Lights Ford Headlights in Multiple—Dual System Possible by Use of Six-Volt Battery.

The Jefferson Electric Manufacturing Company, 847-851 W. Harrison street, Chicago, Ill., is manufacturing the electrical device shown in the accompanying illustration, which is designed to eliminate all lighting troubles of the Ford car with absolutely no loss of current capacity. It is not a resistance coil or a rheostat, but is an auto transformer coil having one continuous winding with taps so that the lights can be connected in multiple.

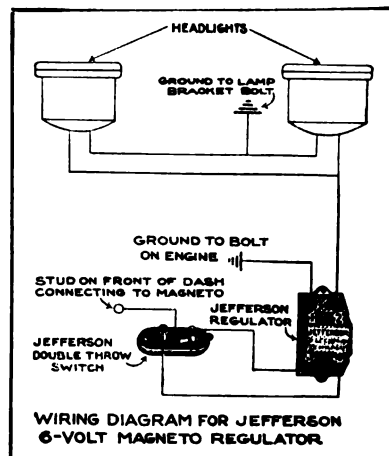


Jefferson Magneto Lamp Regulator.

The sole purpose of the instrument is to step down the current to a lower voltage and increase the amperage. It operates in the magneto circuit and the system lights the headlights in multiple; thus, should one lamp burn out, the other will continue to burn, each headlight being entirely independent of the other.

The regulator is used with either four or six-volt current circuits, the former being used as a dimmer. The latter circuit is designed as a dual system, the regulator being interchangeable with a six-volt storage battery. The battery is used when the car is idle, and the regulator when the car is driven. However, there is no connection between the two, each circuit being operated independent of the other. When a storage battery is used in this manner, it is only necessary to recharge it about three or four times during the season.

Installation is simple and quick. Full instructions accompany each regulator. The retail price of the regulator and double throw switch is \$2.50, while extra double throw switches can be obtained at 25 cents each. Inquiries addressed to the manufacturer will receive prompt attention when this publication is mentioned.

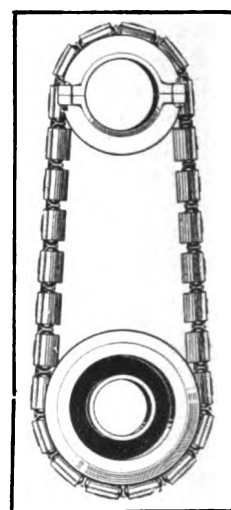


Jefferson Magneto Lamp Wiring Diagram.

WAKEFIELD FAN BELT.

Belt Composed of Leather Blocks and Steel Chain for the Ford Car—Cannot Slip or Fall Off.

The fan belt shown in the accompanying illustration is manufactured by the Wakefield Sales Company, Trempealeau, Wis., and is designed especially for Ford cars. It consists of a hardened steel block chain, each link of which is enclosed by a stamped metal piece and a chrome leather wearer. These parts are fastened together by a rivet between each link. A screw coupling can be obtained if desired. The chain is designed to give satisfactory service for the life of the car provided that it is occasionally lubricated with oil. The chrome leather blocks are unaffected by water or grease, the result being a belt of excellent pulling power. It is obvious that a positive driven fan will greatly assist the cooling system, and as the belt runs on V pulleys, which are furnished, it is impossible for it to slip off. The complete outfit, consisting of pulleys and belt, retails at \$2.50, or \$3 when installed by the dealer. It is sold with the guarantee that if satisfaction is not proved after a 30-day trial, the owner has the privilege of returning the equipment and of having the full purchase price returned. As only the very best material obtainable is used in the construction of the attachment, it is warranted to be free from imperfections. This company also manufactures a complete line of auto straps. Full particulars will be promptly furnished to those who mention this publication when writing.

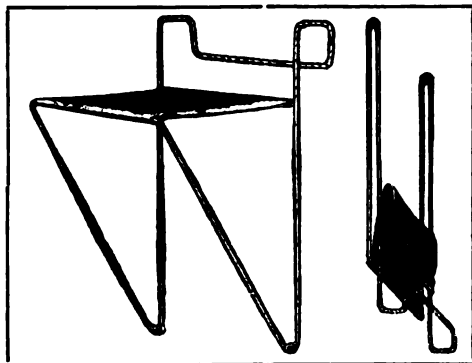


Wakefield Fan Belt.

FOLDING SEAT FOR FORD CARS.

Folding Seat Adapted to Ford Cars Which Hooks to the Top of the Door, Though Weight Is Not Supported.

The McKinnon Dash Company, Buffalo, N. Y., manufacturers of the well known McKinnon folding seats, is marketing an auxiliary seat for the Ford car. This seat



McKinnon Folding Seat for Ford Cars.

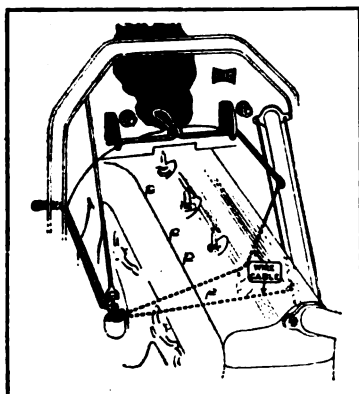
The manufacturer declares that it is impossible for the door to spring open while the seat is in place.

The frame is made of round steel and is electrically welded. It is equipped with a padded art leather seat and the hook fitting over the top of the door is wrapped with the same material so as to prevent scratching the finish. The seat, known as No. 90, is finished in Japan, and retails at \$1.50 each.

PACO FORD ACCELERATOR.

It Permits Speed of Ford Car Being Controlled by Foot, Leaving Both Hands Free to Grip Steering Wheel.

The Paco accelerator illustrated herewith and manufactured by the Peoria Accessory Company, 601-607 South Washington street, Peoria, Ill., is designed to afford a



Paco Ford Accelerator.

convenient foot control of the gas admitted to the cylinders of Ford cars. It is obvious that it effects a saving in consumption of gasoline, as a finer adjustment can be obtained than is possible with the notches on the quadrant. The device is made of strong, durable material, and has but two moving parts. A slight pressure on the foot pedal draws a cable between the cylinders, which in turn controls the carburetor. The action of the accelerator is independent of the hand throttle.

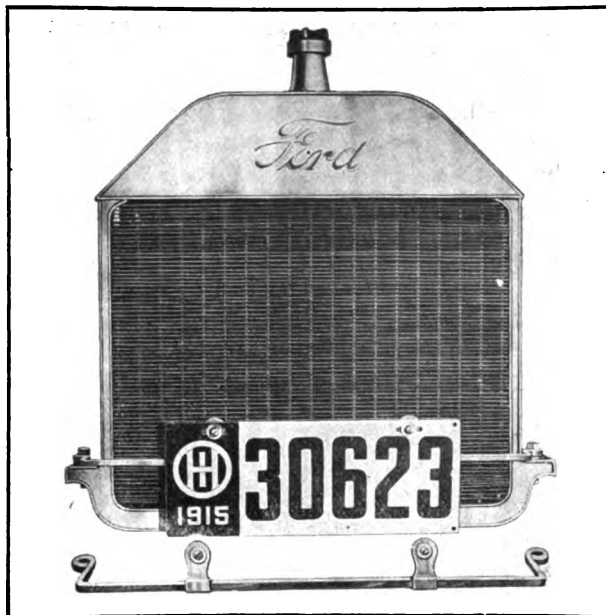
An outstanding feature is that the hand throttle may be set for slow speed, which will prevent the motor from stalling when the pressure is released from the accelerator. The attachment retails complete at \$1.50 and it is guaranteed to give absolute satisfaction.

TOMARIN LICENSE NUMBER HOLDER.

It Is Attached by the Radiator Bolts and Serves as a Re-Enforcing Brace.

The Tomarin Auto Radiator Repair Company, 925 Race street, Cincinnati, O., is manufacturing the new

Tomarin license holder illustrated herewith, which is designed to overcome many of the objectionable features of former means of displaying the license plate. It is a strong bar, which is attached to the car by the same bolts which hold the radiator in place. Slides are fitted to the bar and these are adjustable to the size of the



How New Tomarin License Number Holder Is Attached.

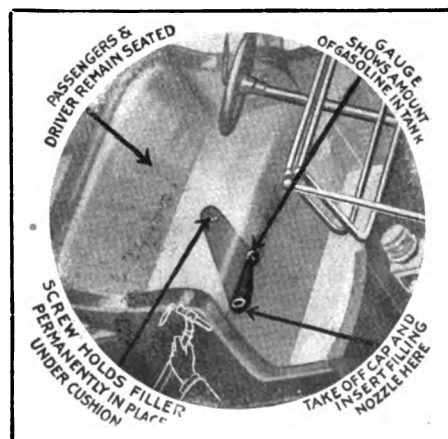
auto license. It does not interfere with the full air circulation in front of the radiator and in the winter serves as a protection against freezing, it being attached at a point where freezing is most likely to occur. Another feature of merit is that the holder serves as a reinforcement for the sides of the radiator. The attachment is sold in nickel, brass or black, and retails in any finish desired at 75 cents each.

APEX FILLOMETER.

Device Which Indicates Exact Amount of Fuel in Tank and Makes for Great Convenience in Refilling.

The Fillometer illustrated herewith and manufactured by the Apex Electric Manufacturing Company, 1410-12 West 59th street, Chicago, Ill., is designed to afford as much, if not more, convenience to the Ford owner than is possible on more expensive cars.

It is a combination of tank filler and gauge and fastens permanently in place under the front cushion. The gasoline tank can be filled while the passengers and driver remain seated. The exact amount of fuel in the tank is indicated by the meter, which is easily read from the driver's seat. The attachment retails complete as shown at \$4.50.



Apex Fillometer Installed on Ford Car.

The exact amount of fuel in the tank is indicated by the meter, which is easily read from the driver's seat. The attachment retails complete as shown at \$4.50.

GOVERNMENT AIDS GOOD ROADS.

Two bulletins issued by the Department of Agriculture are very useful to road officials throughout the country who are seeking the most durable and economical road surfaces for country roads.

The bulletin on brick declares that no brick pavement laid according to the best modern practice has ever worn out. They are expensive to construct, but they last a long time and are cheap to keep in repair. There is a brick pavement on Sixth street in Terre Haute, Ind., which was laid in 1892 on a broken stone foundation and repairs to date have cost only \$200, due to breaks caused by expansion. Part of the pavement carries

heavy traffic. A pavement on Holmden avenue, in Cleveland, laid in 1899, on a natural soil foundation, has never required any repairs and is still in condition to wear for several more years.

The first concrete pavement was laid at Bellefontaine, O., in 1893, along the public square, where it carries heavy traffic,

Wilbur C. Johnson, Recently Elected Secretary of the Electric Vehicle Manufacturers' Association.

and it has cost only \$200 for repairs in 20 years. These pavements are strong enough to carry the ordinary rural and suburban traffic. They produce no dust and are easily maintained.

Wayne county, Mich., in which Detroit is located, began laying these roads in 1909 and in 1914 had laid 19,000,000 square yards. California has 800 miles of concrete road and New York has used much of the material. Illinois, Wisconsin and Iowa are other states in which this type of paving is used.

ANDERSON REPORTS BIG BUSINESS.

Lee Anderson, sales and advertising manager of the Hupp Motor Car Company, has been visit-

ing the West and northwest. He reports that crops are the best in Iowa and Nebraska, and that tremendous sales to farmers are to be expected. All lines are extremely active in those districts. In Utah, Colorado, Washington and Oregon he found the dealers selling more cars than they are able to deliver.

JOHNSON SUCCEEDS CHALFANT.

Wilbur G. Johnson, vice president of the Waverley Company, was elected secretary of the Electric Vehicle Manufacturers' Association at a meeting held recently at Toledo. He succeeds E. B. Chalfant, who has resigned.

The association is an organization devoted primarily to the promotion of good feeling and healthy co-operation in the electric vehicle industry. An effort is made to maintain the natural rivalry and competition of manufacturers and dealers on a basis that prevents ill feeling while all work together for the general good.

Mr. Johnson will retain his active interest in an official connection with the Waverley Company, where he has direct control of sales and promotion work, a position that enables him to work most effectively in harmony with the association.

ENGLISHMEN GET 500 ROSS EIGHTS.

There is such a demand for American cars on this side of the water that English dealers who desire cars to keep their businesses going have had great difficulty in getting them. John Overton and Walter Middleton of Mann-Overton's, Ltd., of London, recently made a trip here to get cars. They wanted an eight-cylinder and selected the Ross Eight. These will be finished with some special fittings for the English market. Five hundred have been ordered and will be distributed through the many branches of the retail concern in England and its colonies. T. P. C. Forbes, president, and G. S. Patterson, vice president of the Ross Motor Sales Company, have assured the English dealers of prompt delivery of their orders.

Auto Comfort, the attractive house organ of the Hartford Suspension Company, contains for September, in addition to its usual features, interesting items on the Hartford electric brake and cushion springs for stiff springed vehicles. It is handsomely printed and has an attractive "pretty girl" cover.

DIXIE HIGHWAY EMBLEM READY.

The Dixie highway emblem, which is to be given to those interested in the promotion of the Dixie highway for attachment to their cars in order to secure additional publicity for the undertaking, has been designed, and the first emblems have been received from the factory. They represent a bale of cotton with binders around it. Set into the side of the cotton bale is a white field with the words "Dixie Highway" upon it in red. This is arranged for easy attachment to a motor car. The emblems are numbered serially, so that no two members of the association will have the same numbers.

EDUCATE CHILDREN IN SAFETY.

To educate children in ways of preventing accidents on the roads, the Ontario Motor League has offered cash prizes for the best compositions on "How Children May Help to Avoid Motor Accidents." The competition is open to children in the public, private and separate schools of Toronto, Hamilton, Ottawa and London, Ont. Prizes range from \$1 to \$10 and are divided in two classes, one for children under 12 years old and one for children over 12.

MUD HOLE PIRATES IN KANSAS.

The farmers of Kansas and Missouri are said to have made so much money pulling motorists out of the mud at \$5 a pull during the heavy rains of the early summer that they are extremely displeased when the roads dry up. It is said that some of them have secretly hauled tank wagon loads of water to selected spots during the night so that they would be very soft the next morning. When the motorist gets hopelessly stuck in one of these pits the farmer providentially appears with his team and offers to do five minutes work for \$5.

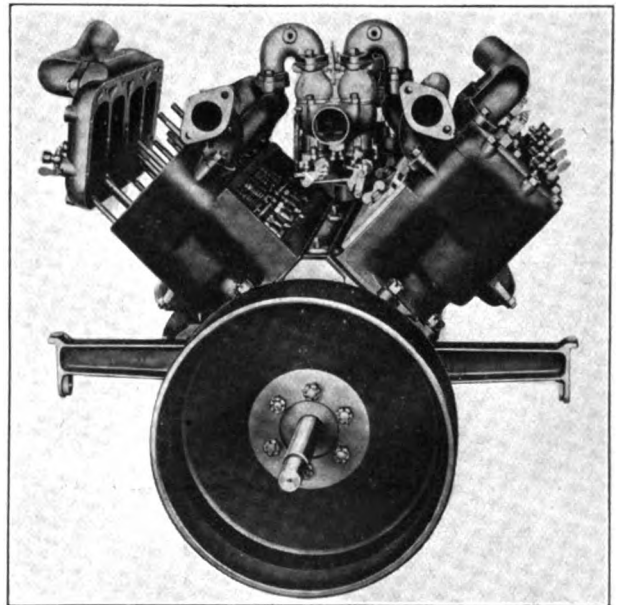
SELL 600,000 CARRIAGES.

In spite of the sale last year of more than 700,000 automobiles, the carriage makers, who recently held a convention in Cleveland, reported that 600,000 buggies and carriages had been disposed of. There were 340 delegates in attendance. They resolved "to go home with heads up and tails over the dash board ready to inject more vim and energy into the good old industry."

REGAL'S ACCESSIBLE MOTOR.

One of the outstanding features of the eight-cylinder motor employed in the Regal Eight for 1916 is its extreme accessibility, as is shown in the accompanying front sectional view. The components mounted in the V are so attached that they can be easily and quickly removed for access to the valves, which are protected by a copper plate that in turn can be easily dismantled. The cylinder heads are held in position by bolts and nuts, but are easily taken off if the owner wishes to reach the interior of the cylinders for grinding purposes or to remove carbon.

In Regal construction the valves operate on



Front Sectional View of the Regal Eight-Cylinder Motor, Emphasizing Its Accessibility.

upper sides directly in line with the single camshaft, thus eliminating the need for rocker arms and reducing the number of working parts. The motor has a three-inch bore and 4½-inch stroke. It weighs only about 40 pounds more than the standard four-cylinder motor and takes up no more room in the chassis.

The Dyneto starter, the timing apparatus, the oiler and the spark plugs are placed so that they are as accessible as in any other design.

The Regal company reports an ever increasing demand for its eight, which is priced at \$1200 with complete equipment, and has 115-inch wheelbase, and is convinced that it has found the timely eight-cylinder model. The company is understood to be preparing for record production in 1916.

PRACTICAL FACTS FOR NEW CAR OWNERS.

Elementary Instructions in the Economical Operation, Maintenance, Adjustment and Repair of the New Car—Answers to Inquiries.

PROPER lubrication of the automobile is a subject upon which engineers have spent years in bringing up to the present excellent standard of practise. Makers of lubricating substances have spent many thousands of dollars in experimentation to produce the ideal lubricant, and both classes of experts are making discoveries every day that make it possible to better meet the excessive demands of the mechanism of the motor vehicle.

The necessity for lubrication in any machine constituted of moving parts is absolute, just as is the law of mechanics that the work accomplished

them smooth enough to entirely eliminate friction. If a piece of highly polished steel is placed under a powerful magnifying glass, it will be seen that the surface is porous and has projecting particles that are like miniature saw teeth. It is these projections that rub against each other and create friction. The faster the surfaces rub, the greater is the frictional heat created. At certain high speeds the heat will become so great as to cause "binding," unless there is lubricating substance present in sufficient quantities to offset the friction.

The theory of lubrication is to place a film of

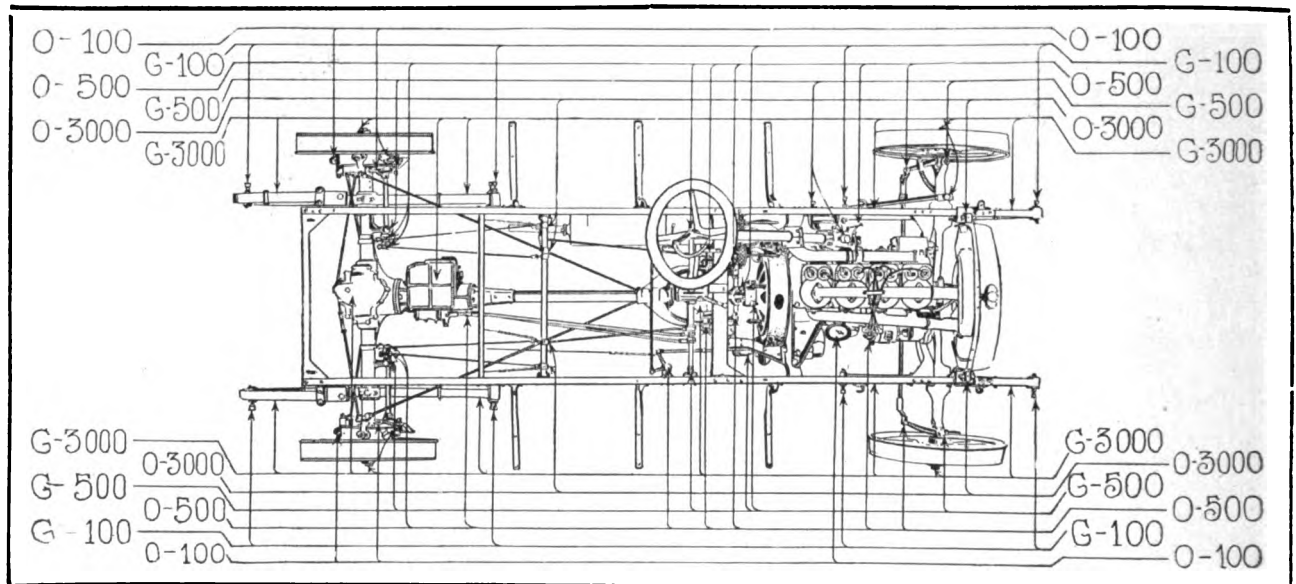


Fig. 1—Lubrication Chart Supplied with Overland Cars—Letters O and G Indicate Whether Oil or Grease Is to Be Used, and the Figures Following Indicate in Miles the Frequency of Lubrication.

by any machine is never equal to the power applied to it. Both these conditions are due in large measure to friction, the rubbing together of two or more moving parts, which has the effect of retarding the motion. Therefore, the purpose of lubrication is to offset this retarding effect by placing such substances between the moving parts as will reduce the friction as much as possible.

Friction between two metal surfaces is because of the fact that both surfaces are not absolutely smooth—in fact, it is impossible to make

oil or other lubricant between the moving parts to cover the rough projections, and the principal mediums used for this purpose are oils, greases and graphite, the latter a form of crystalline carbon. These substances have been found to not only reduce the friction, but to prevent to a large degree the moving parts from wearing out quickly.

Every car owner should study his car thoroughly and exercise extreme care in selecting the quality of lubricant best suited for his machine. The basis of lubricating oils is crude pe-



Dustless, Mudless Automobile-proof Roads—

*Swansea State Road, Mass.
Treated with "Tarvia B".*

The beautiful, little old town of Swansea is opposite Fall River, and automobile traffic streams through it the whole year around en route to Providence.

Because of this traffic Swansea for some time suffered from the dust nuisance, but with the co-operation of the Massachusetts Highway Commission it solved the problem by using "Tarvia B".

In 1912 Swansea used 18,000 gallons, in 1913—30,226 gallons, and in 1914—18,000. The present plan is to use 18,000 gallons hereafter each year. This is sufficient to take care of the

whole area treated and is made possible by the smaller quantity required for re-treatment.

"Tarvia B" is applied to the macadam surface without heating after the surface has been swept clear of surface dust.

The Tarvia percolates into the surface, forming a sort of plastic concrete with the stone. This tarvia-concrete is *dustless, mudless and automobile-proof*.

Swansea has found that such treatment keeps its roads in fine order the year round at practically no extra expense, because this treatment adds greatly to the life of the road and saves in other maintenance expenses.

Illustrated booklet on request.

Special Service Department

This Company has a corps of trained engineers and chemists who have given years of study to modern road problems. The advice of these men may be had for the asking by anyone interested.

If you will write to the nearest office regarding road problems and conditions in your vicinity, the matter will have prompt attention.

BARRETT MANUFACTURING COMPANY

New York Chicago Philadelphia Boston St. Louis Cleveland Cincinnati
Pittsburgh Detroit Birmingham Kansas City Minneapolis Salt Lake City Seattle Peoria
THE PATERSON MFG. CO., Limited; Montreal, Toronto, Winnipeg, Vancouver, St. John, N. B., Halifax, N. S., Sydney, N. S.



Meet me at the
Tuller

For Value,
Service, Home
Comforts



New HOTEL TULLER
Detroit, Michigan

Center of business on Grand Circus Park. Take Woodward car
get off at Adams Avenue.

ABSOLUTELY FIREPROOF

200 Rooms, Private Bath, \$1.50	Single, \$2.50	Up, Double
200 " " " 2.00	" " 3.00	" "
100 " " " 2.50	" " 4.00	" "
100 " " " 3.00 to 5.00	" " 4.50	" "

Total 600 Outside Rooms. All Absolutely Quiet.
Two Floors—Agents' New Unique Cafes and
Sample Rooms Cabaret Excellente

EISEMANN

The most simple—the most accessible—the most durable—the most efficient magneto ever produced is the new Type G-4.

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troleum, which to be made suitable for use on the automobile mechanism must be refined with much particularity. The crude oil contains acids that are deleterious to all metal parts with which they contact, most particularly to the automobile cylinder, which is due to the rapid decomposition of the acids by the intense heat.

The effect of heat and friction is noticeable in the rifle barrel. If bullets are discharged rapidly and without appreciable pause between the discharges, the barrel will become extremely hot and expand, and frequently burst. This is because of the friction set up by the passage of the bullets and the heat generated by the explosions of the powder.

There is a slight similarity in the effect on the cylinder of the motor. There are thousands of explosions of gas in a short period, and the swift movement of the pistons rubbing against the cylinder walls creates a great amount of fric-

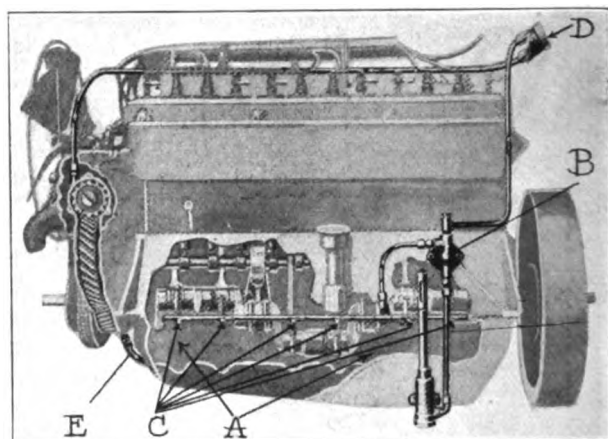
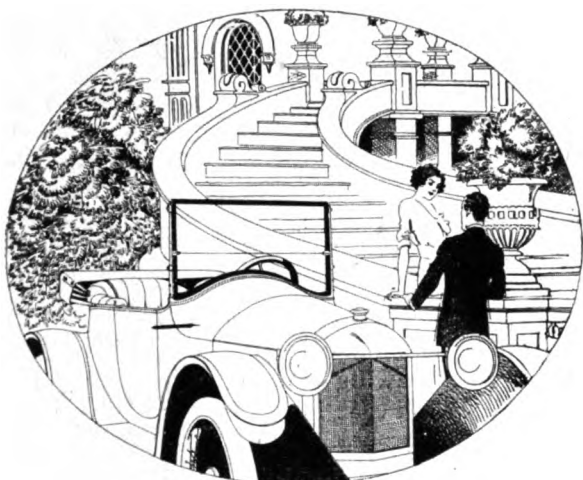


Fig. 2—Operation and Components of the Pump and Plunger Lubricating System.

tion. It should not be wondered at then that the cylinders are the most difficult components to keep lubricated satisfactorily. It is good practise to mix a small proportion of flake graphite with the oil in the crank case, which, not being effected appreciably by cold or heat, fills the pores of the metal and reduces friction to a minimum.

There are many tests by which acids may be detected. One of the simplest is to combine a small quantity of the lubricating oil with alcohol and after the two have been thoroughly mixed, insert a piece of blue litmus paper. If acid is present, the paper will turn red.

Lubricating oils are usually subjected by the producer to five tests: Specific gravity, flash, fire, cold and viscosity. Not long ago, the specific gravity of an oil was the standard established for determining the quality. At present this is not



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is a basis of decision, but real worth is the final test of judgment.

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fort and luxurious travel with a real elegance of outline, Scripps-Booth cars are become a part of the home equipment along the most exclusive of the world's thoroughfares and in the most exacting of all metropolises.

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regarded as a conclusive test, although it may be stated that as the specific gravity of a particular oil increases, its viscosity also increases accordingly.

The object of the flash test is to determine the point at which the vapor will ignite, but not burn. Oils used for lubricating automobile engine cylinders require a very high flash point.

The first test indicates the burning point of the lubricant, and the cold test is to ascertain the temperature at which the oil will congeal, which should be well below the temperature at which it is to be used, as otherwise the friction would be correspondingly increased.

The body of an oil is described as its viscosity or fluidity. This test usually consists of placing a given quantity of lubricant in a retainer and allowing it to escape a drop at a time, the exact number for a given period being recorded. Another oil is then placed in the same retainer and under the same conditions and allowed to escape in the same manner. The one which flows the quicker is the more fluid, while the other is of the greater body or more viscosity.

The question often arises, "Why isn't castor oil more generally used as a lubricant, since it renders satisfactory service in racing and aero-

plane motors?" Castor oil is a vegetable product, and gums readily in slow running motors. It is used extensively in racing and aeroplane motors because these are high-speed engines and, therefore, require an oil of high viscosity. This is made necessary by the great clearance between the piston and cylinder walls. The greater bulk of the gumming usually takes place when the motor is cool, or is cooling. This makes little difference to the racing car, as it is generally overhauled at the completion of each race. There are several other conditions that militate against the general adoption of this lubricant, included in which are the prohibitive price of pure castor oil and the disagreeable odor given off when burned.

The usual method of supplying the oil to the cylinders is by the splash system. In this system the lower cap of the connecting rod is fitted with a small scoop, and at each revolution of the crankshaft it dips into the oil reservoir of the crank case and throws the lubricant on the lower walls of the cylinder. Here it is picked up by the piston and rings to lubricate the entire cylinder.

Frequently the oil will work by the piston rings and into the combustion chamber. If the amount is slight it will be burned and expelled from the cylinder at the same time as the burned

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mixture. If the amount is large, however, it cannot be fully burned and adheres to the piston head, cylinder walls, etc., in the form of carbon.

Once carbon starts to form it will attract further accumulations. Carbon is recognized as being the embryo of the diamond and its effect on the highly polished cylinder walls cannot be overstated. The only remedy for carbonization is to fit tighter piston rings or to use a heavier oil.

Tests have proven that all oils undergo more or less of a chemical change when subjected to the heat of the motor. This fact can be substantiated by drawing some oil which has been used in the crank case for a day or two. A dark sediment will generally be found. Some oils produce more sediment than others, but it is to be found in the best of oil and it is, therefore, necessary to drain and wash the crank case at regular intervals.

The question now arises, "How long will a gallon of oil last?" There is no reason why a gallon of oil should not last for about 800 to 1000 miles, providing that every part is mechanically perfect. However, this service is not usually obtained.

Many practical motorists are obtaining a greater oil service by slightly rounding the top edge of the piston rings. This prevents the sweeping of the oil into the combustion chamber. On several new cars a small groove is made below the bottom ring. Small holes are cut through the piston wall at the base of the groove so as to drain off the surplus oil.

Another method of lubrication is the force feed. Many cars, especially the late models, have hollow crankshafts, connecting rods and camshafts. Oil is forced through these to the main bearings, journals, wrist pins and to the cylinder walls. The pump system has many advantages, among which are the positive supply to all bearings, assurance of lubrication even though the oil level be below normal, radiation of heat, etc.

The accompanying illustration, Fig. 2, shows the lubrication system of a well known six-cylinder car. In this system a pump of the plunger type is used. The oil is carried in the reservoir, A, which is formed by the crank case. The pump, B, draws the oil from the reservoir and forces it through the pipe line, C, from where it is splashed on the connecting rod bearings. Surplus oil is pumped through the sight feed, D, on the dash, from where it flows over the timing gears. The return is made to the original reservoir by a pipe line, E. The cylinders are lubricated by the splash system, the oil being

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picked up by the small scoops attached to the connecting rods.

The lubricating system used on another popular priced car is shown in Fig. 3. An oil pump operated from the camshaft draws the lubricant from the base and after it has passed through a strainer raises it through the sight feed on the dash. From here it runs into small troughs and is splashed by the connecting rod scoops into the bearing surfaces.

The steering mechanism of a car is often neglected, although the failure of this apparatus may often prove to be of a serious nature. The grease cups should be filled with clean lubricant and well screwed down. At regular intervals it is good policy to inject a little oil through the grease cups. This tends to keep the grease soft.

Frequently, motorists complain of lost motion in the spark and throttle connections. Usually

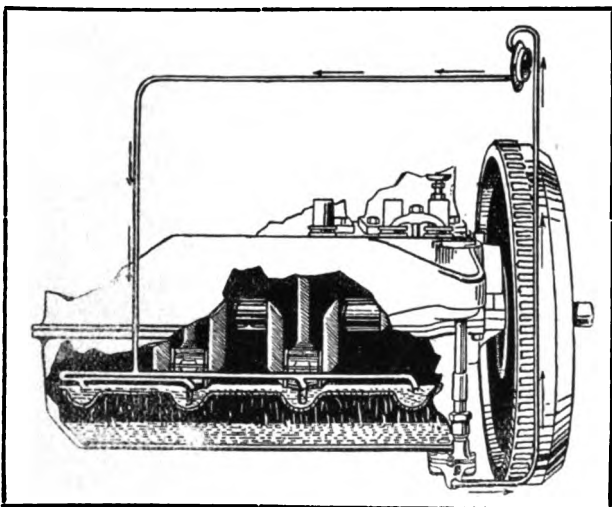


Fig. 3—An Example of Splash and Pump Oiling System.

this is the result of lack of lubrication. If they are of the ball and socket type, they should be cleaned with gasoline or kerosene to remove all foreign elements. Good results can be obtained by lubricating these joints with a mixture of grease and flake graphite.

Recently an expert described the ideal lubricating practise as follows:

First—Maintain a normal oil level in the motor.

Second—Fill gear boxes and keep gears well covered with lubricant.

Third—Fill grease cups and lubricate every moving part that is subject to friction.

Gear boxes should not be completely filled, as lubricants possess a certain amount of expansion power when heated or churned. An example of this can be seen almost every day when grease leaks out of the differential housing onto

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Enormous production and a nation-wide market makes it possible for every car owner to purchase Improved S-M-C Brake Lining at no greater cost than what is charged for other makes.

There is a special brake lining made for Fords sold in carton carriers, cut in the right lengths, ready to attach. The most efficient lining for this make of car that science has produced. If your dealer cannot supply you promptly write direct.

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the rear wheels. Of course there are other conditions which may cause this result, but generally it will be found that an effective remedy can be had by decreasing the amount of lubricant in the case.

Charts similar to the one shown in Fig. 1 are usually supplied with the new car. This should be followed closely until the motorist has acquired the habit and knows just where and when to lubricate.

READERS' QUERIES.

Suggestions to Owners on Lubricating the Car, How Oil and Fuel Carbonize, How to Lubricate Rear Springs, and Why Front Cylinders Carbonize Quickly.

Lubricating the Car—G. U., Germantown, Penn.

How often is it necessary to insert lubricant in the crank case and in the gear boxes? Should different lubricants be used for different seasons?

The fact that lubricant sometimes works out through the bearings should they be worn, or at the cover should it be loose, makes it impossible to set an arbitrary time for lubrication. However, should these be absolutely tight, it is good practise to remove all lubricant from the boxes at the completion of every 1500 miles and to thoroughly wash the gears and case with kerosene. New grease should be used when replacing. Gauges are located at the side of the crank case on most late models to indicate the exact amount of oil in the case. A motor in perfect condition should run at least 100 miles without requiring replenishment of lubricant.

Engineers differ as to the grades of lubricant to use in the different seasons, but if a change is required, it is generally believed that a much thinner body is required for winter than summer.

Carbon Deposits—G. L. B., Norwalk, Conn.

Will too rich a mixture cause carbon to accumulate in the cylinders, and if so what is the cause of it? How does oil cause carbonization?

Gasoline contains a certain amount of carbon and when the mixture does not contain enough air to permit the igniting of all the carbon contained in the gasoline, that portion will remain in the cylinder in the form of a very fine and gritty powder. This adheres to the oil on the piston and cylinder walls and gradually the oil becomes gummed by the heat and results in hard carbon. The same applies to oil. The lubricant

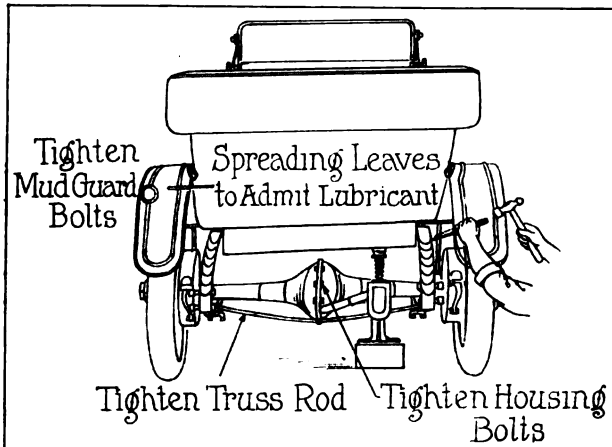
contains carbon, the exact amount of course depending upon the grade used. When an excessive amount of oil is used, the combustion causes a portion of the oil to be burnt, but the excess carbon remains on the piston and cylinder walls.

Inserting Lubricant in Rear Springs—N. V. G., Kingston, Mo.

Can you explain the method usually employed to insert graphite between the leaves of the rear springs of a touring car? Is graphite a good lubricant for this purpose? The rear end of my car rattles a great deal and the differential housing leaks grease. The car has been run about 3500 miles and has had no repairs made on it.

Flake graphite used as a lubricant between the leaves of the spring will reduce all friction and afford the leaves their full resiliency. To insert the graphite it is necessary to spread the spring leaves apart.

There are several kinds of very good leaf spreaders on the market, but in the absence of



A Practical Way to Insert Flake Graphite Between the Leaves of Rear Springs.

any of these the plan shown in the accompanying illustration will give satisfaction. The jack is placed under the body to release all weight from the spring. The shackle bolts are then loosened and a cold chisel driven between the leaves, as shown. Place the graphite between the leaves and then spread for the entire length with a stiff feather. Repeat the operation for each leaf.

In regard to the rattling, it is the writer's opinion that a general tightening of bolts is needed on your car. Especially, tighten the mud guards and truss rods. The tightening of the differential housing bolts will, no doubt, prevent the lubricant from leaking out. Ascertain that the truss rod supports the housing or sagging may result.

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Silks, cottons or other fabrics made water proof without stain or stiffening.

If your dealer doesn't sell Never-Leak, send us his name or write direct. Put up in ready-to-use cans, quarts \$1, half gallon \$1.75 and gallon \$3. Quart will cover roadster top and half gallon will cover 5-passenger touring car top.

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Mixed Fuel—C. M. J., Nashua, N. H.

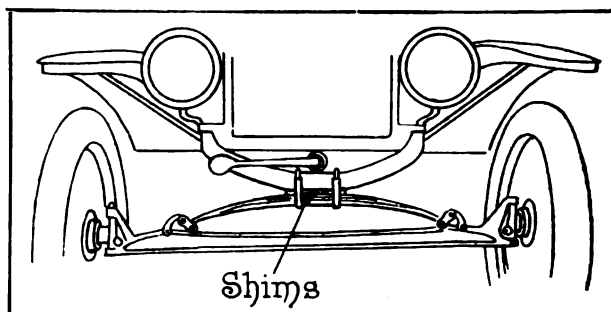
Are there any advantages to be gained by combining kerosene with gasoline and using the mixture as a fuel?

The writer does not think there are any advantages to be gained by combining the two liquids, kerosene being especially difficult to vaporize unless heated. No trouble may be evidenced with the mixture at first, but gradually the kerosene will settle in the carburetor and completely fill the float chamber. If this is not drained off, poor carburetion will usually result. The pecuniary saving will not be sufficient reward for the trouble caused.

Front Cylinder Carbonizes—H. L. F., Port Chester, N. Y.

Can you suggest what the trouble might be with my Ford car? The front cylinder carbonizes sooner than the rest. The level is correct and I have fitted new rings in the front cylinder.

Your trouble is a not uncommon happening. A long experienced repair man states that on several of the cars brought to him for the above trouble he has found that the settling of the front



Shims Between Transverse Spring and Frame to Overcome Carbonization of Front Cylinder.

spring has placed the motor on an angle and caused a greater amount of oil to settle at this end than at any other part. A simple remedy for this is to place suitable pieces of packing between the transverse spring and the frame, as shown in the accompanying illustration. If this does not improve the condition, use a thicker oil.

Contact Points of the Ford Coil—B. M. J., Camden, N. J.

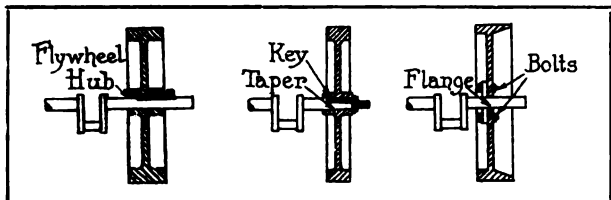
To settle an argument, will you please tell me the kind of material used to make the contact points of the Ford coil?

Until recently the contact points of the Ford coil were made of platinum, but at present the new coil units are of tungsten. The latter is a harder metal and less liable to get out of adjustment. However, the old coil units are not designed for use with tungsten points and neither can satisfactory results be obtained by using both types of points in the same coil box, as they will not synchronize properly.

Motor Knocks—J. B. D., Cranston, R. I.

I recently purchased a second-hand touring car, which has always been used with the greatest of care. The motor has plenty of power, but at all speeds there is a decided knock, which is much louder at high speeds than at low. It does not sound unlike a connecting rod, but examination shows these to be tight. The main bearings are tight, and I am at a loss to locate the knock. The sound would indicate that some part is very loose. I will be thankful for any suggestion which you may have to offer.

It would appear that the flywheel is loose on the shaft. This would produce a heavy thump, or pound, and is frequently mistaken for a loose connecting rod. In the earlier forms of construction the flywheels were simply keyed to the shaft, and if these keys were improperly fitted, the wheel soon becomes loose on the shaft. It is obvious that the only remedy for this trouble is to fit new keys, making sure that it is a good drive fit. The present construction uses a flange cast integral with the crankshaft and to which the flywheel is fastened by bolts. Should these bolts become slightly loose, the holes in the flanges are generally pounded oval. When this condition exists, it will be necessary to ream the holes to the next larger size and fit new bolts.



Three Methods by Which Flywheels Are Usually Secured to the Shaft.

The accompanying illustration shows three methods of retaining the flywheel.

Motor Knocks—F. M. P., Oldtown, Me.

I intend to make a tour of the New England states in the near future and am preparing my car for the trip. At times I am troubled with a sharp metallic knock and would like to know if there is any way to tell whether this is a loose connecting rod or not. The car is of the earlier type and the only way that I can reach them is to drop the lower half of the crank case, which is a very disagreeable operation.

The trained mechanic can locate most any knock developed in a motor without having to disassemble any of the parts. A slightly loose wristpin and a carbon knock produce the same sound. The latter may be your trouble, as you state that the knock only appears at times. This sound is a very sharp rattle, not unlike that produced by striking a six-inch piece of steel with a hammer. It is not necessarily dangerous, but may do injury to the motor if allowed to continue, through the carbon becoming incandescent and preigniting the gas charges, thereby having a tendency to force against the piston before it

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"25" Roadster, 1916 model. Price \$600, completely equipped. Built on same chassis as Touring Car, with 108-

inch wheel base and carries identical equipment, including electric starter and electric lights, 25-horse power water-cooled motor, large wheels and tires, rain vision wind shield, instant one-man top, speedometer, built-in gasoline gauge, signal horn, etc. A wonderful hill climber, and for reliability in road performance is absolutely unsurpassed. Write for DEALER particulars and new illustrated catalog "Q."

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has passed dead centre. The several methods employed to remove carbon have been explained before.

The loose connecting rod has a rather heavy knock or pound and will occur at regular intervals, whether the engine be running at low or high speeds, although the sound is much louder when pulling and running at high rates of speed than at low. This knock is dangerous and should be immediately remedied, as it is liable to loosen the main bearings by its jerky action on the crankshaft.

Motor Misses at Slow Speed—L. J. C., New Berlin, N. Y.

I have a Buick, 1910 model 10, which is giving me trouble in firing when running at 15 miles an hour or slower. At 20 miles and over it runs without a miss. The cylinders are not carbonized, compression is good, as are also the valves. The magneto is a Remy type S, and the breaker points are in good condition. The wiring is new. The plugs seem to fire out of the cylinders all right. The carburetor is a Schebler model D. I have tried adjusting this, but the result is the same. What carburetor would you advise using if a change is necessary? The motor starts easily whether cold or warm and does not heat up. I think the timing is all right.

You may be experiencing the same trouble that is to be found on many of the earlier models. The action at low speeds becomes jerky and the owner is prone to condemn the carburetor, which, however, is not always at fault.

Through long service, gradual wear takes place between the valve stem and guide. As the mixture is drawn into the cylinder by the suction of the piston, that suction also draws in an excess of air through the apertures left by the worn guide. As the amount of air drawn in varies, it is impossible to effect an adjustment of the carburetor for all speeds. Air is also frequently drawn through a loose manifold joint. Of course this condition could not be detected by testing compression. The only remedy is to ream the guide and fit new bushings, or to use packing in the guide. Material for this purpose can be obtained at most dealers.

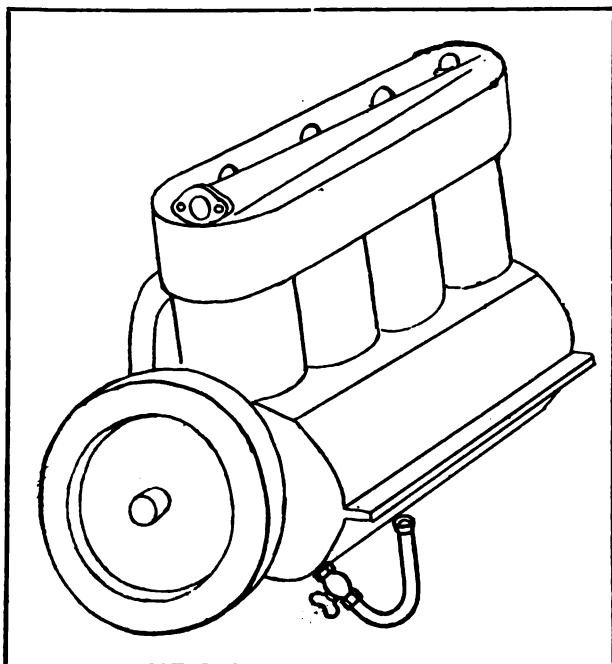
Test the magnets on the magneto for their efficiency. A good magnet should lift and hold a weight of at least 15 pounds. You should also disassemble all spark plugs and examine the porcelains for small cracks. A plug may fire perfectly out of the cylinder, but when subjected to compression a small crack may be opened and cause a miss, which is difficult to locate. Ascertain that the air gap in the plugs is not too great. Next check the valves to determine that each fully closes. The distance between the plunger and the push rod when the valve is fully closed should correspond to the thickness of an ordinary name card.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

A Smoky Exhaust—H. M. C., Brooklyn, N. Y.

I have a light delivery truck which has no gauge on the crank case. Is there any way of determining the oil level and maintaining it? The exhaust is very smoky and I have been cautioned by the police. The car is of the earlier type, but still gives good service.

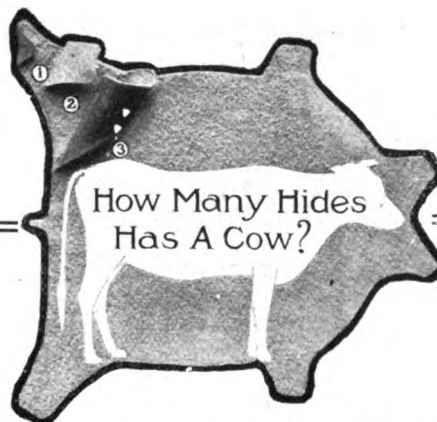
A smoky exhaust is the result of an excessive amount of oil in the crank case. Not knowing the type of motor in question, it is impossible to state the exact quantity of oil to use. However, gradually drain off the oil until the smoking ceases. This should be the point at which the level should be maintained. Of course there are many oil gauges on the market which, no doubt, could be attached to your motor, but a simple device that will give satisfaction can be adapted as follows: Drain the oil from the crank



A Practical Home-Made Oil Gauge for Old Models of Motors.

case into a measure and then drill and tap a hole in the lowest corner of the crank case for a $\frac{1}{8}$ -inch pipe thread. A pet cock, having a male and female thread, should be turned into the hole. Thread a piece of $\frac{1}{8}$ -inch copper tubing at one end and bend so that the other end will stand upright when attached to the pet cock, as illustrated. The oil should be replaced in the crank case and the pet cock opened. The level of the oil in the crank case will be indicated by the height of the oil in the tube, which should be cut off at this point. If the opening be spread out, the level will be easily seen. Great care must be taken in bending the copper tubing, as it is liable to split. A good policy is to fill the pipe with hot rosin before bending. It can be easily removed by heating.

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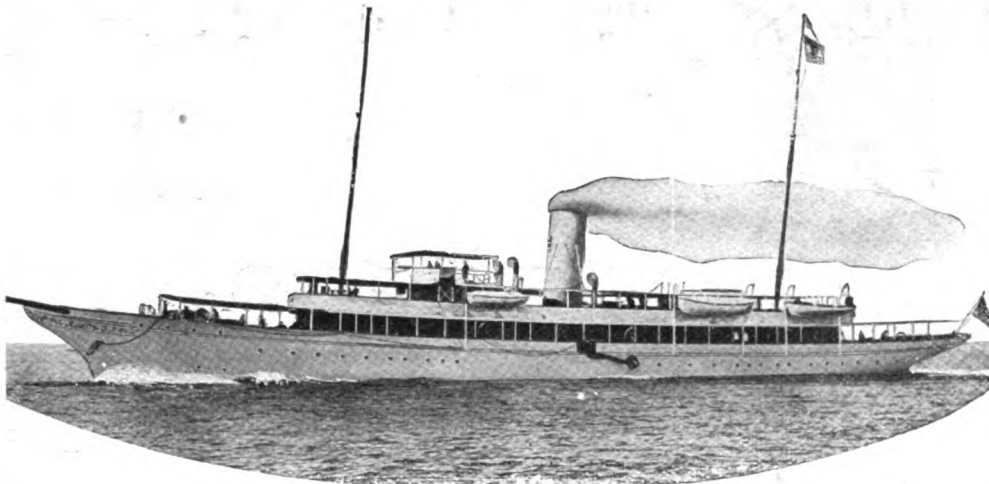
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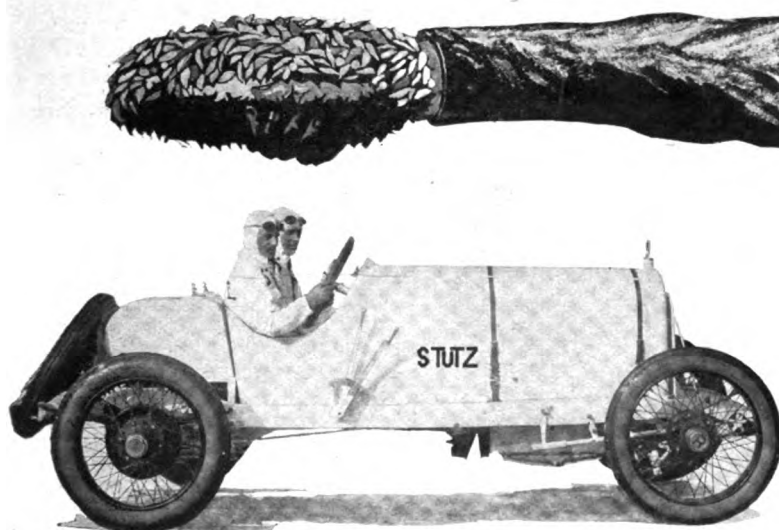
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UNCLE SAM HONORS HIMSELF, IN AWARDING THE WREATH OF VICTORY TO

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Over 10 minutes faster than either man or machinery have ever traveled for this distance.

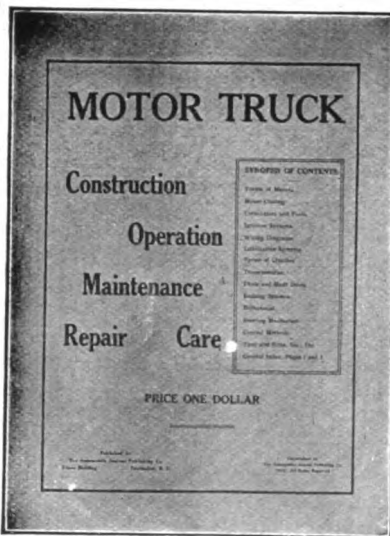
Never in the history of motoring has **superiority** been so vividly demonstrated as the Stutz performance in this race. At the end of a season replete with victories Stutz capped the climax at the Sheepshead Bay Speedway by two of the cleanest "wins" ever made. Against a field including the supposed-to-be World's best cars driven by the most noted drivers Stutz absolutely swept all before them. "Foreign built racers no match for the Sturdy Stutz fliers" is the verdict of all experts.

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Index to Advertisers.

	Page
Ahlberg Bearing Company.....	57
American Bureau of Eng.....	11
Barrett Manufacturing Co.....	63
Bosch Magneto Company.....	5
Boyd, F. Shirley.....	62
Coes Wrench Co.....	2
Culver-Stearns Mfg. Co.....	62
Dixon Crucible Co., Jos.....	59
Dover Stamping & Mfg. Co.....	60
Eagle Oil and Supply Co. Cover	
Elsemann Magneto Co.....	63
Goodyear Tire and Rubber Co.....	57
Harris Oil Co., A. W.....	57
Hartford Machine Screw Co.....	61
Hartford Suspension Co.....	1
Heinze Electric Co.....	58
Inter-State Motor Co.....	58
Marburg Bros.....	59
McQuay-Norris Mfg. Co.....	59
Mea Magneto Co.....	59
Mecca Mfg. and Spec. Co.....	4
Metz Company.....	62
New Departure Mfg. Co.....	58
Nordyke & Marmon Co.....	63
N. Y. & N. J. Lubricant Co.....	59
Peerless Motor Car Co.....	62
Pierce-Arrow Motor Car Co. Cover	
Reo Motor Car Co.....	7
Scripps-Booth Co., The....	Cover
Splittdorf Electrical Co.....	60
Springfield Metal Body Co. Cover	
Standard Oil Co., The.....	55
Staybestos Mfg. Co., The.....	63
Stutz Motor Car Co.....	3
Superior Mfg. Co., The.....	60
Texas Oil Company.....	63
Thermoid Rubber Co.....	58
Times Square Automobile Co., 4	
Valvoline Oil Company.....	63
Vanderpool Co., The.....	4
Weed Chain Tire Grip Co.....	12

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D. O. Black, Jr., Secretary.

Times Building, Pawtucket, R. I.

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VOL. XL.

OCTOBER 25, 1915.

NO. 6.

PUBLISHER'S AND READERS' PAGE.

CONSISTENT with the Long Established editorial policy of The Automobile Journal, which is to give its readers accurate, unbiased, interesting and valuable information on all subjects relating to automobiles and their accessories, there appears in this issue a timely article on the subject of automobile stealing. It is authoritative and valuable and contains many suggestions that will repay the car owner to heed. What makes for additional value over the usual method of presenting such articles are the descriptions of the representative devices for locking the car during the owner's absence. The Editor scoured the market thoroughly for the most representative locks, and presents a large number of them herewith, so that the reader can choose which ever device best suits his needs. That every car owner needs a lock is undeniable, as is shown by the police records of every city and town in the country.

The Demand for Those Numbers of The Automobile Journal that contain installments of the Motor Starting and Car Lighting series has been so great that the reserve supply of extra copies has been exhausted. The publisher takes opportunity in consequence thereof to urge upon the subscribers the advisability of keeping each number of the magazine, for the information contained therein is of much value and a large part of it cannot be duplicated. This is particularly true of the Starting and Lighting series. When completed it will form a very valuable compendium of all the available and important information relating to the functions, the care and the repair of the several systems now being used in motor vehicle construction.

The Car Owner is Demanding full mechanical details of motor vehicles and their components and accessories with increasing insistence. It is not idle curiosity, but has to do with the practical application of the knowledge to the maintenance and operation of his particular car. Recognizing this tendency, the publisher has prepared and published a complete

library of automobile mechanics, containing about 1000 pages and 2000 illustrations, and covering every subject relating to automobile mechanical practise. There are 11 books and they are thoroughly indexed for quick reference. Written by recognized authorities, they contain invaluable information that cannot be obtained at their moderate prices through any other series of books. Their scope is indicated by the following titles of the books: En-

gine, Magneto, Battery, Carburetor, Tires, Chassis, Lighting, Overhauling, Operation, Motorcycle and Truck Operation.

The Letters of Inquiry received this last fortnight give evidence of a commendable desire on the part of the writers to assist the Editor of the Mechanical Department by giving full data concerning the component inquired about. This is of much help in preparing answers. This correspondence department is open to every subscriber, and the only conditions attached are that the inquirer must give his name and address and an adequate description of the component under discussion. The name will not be published, and the answer will be sent by mail if desired. No attention will be paid to anonymous communications.

The Show Season Has Begun in some of the large cities, and exhibitors are reporting unprecedented successes. The annual show numbers of The Automobile Journal will be as distinctive as ever, and will thoroughly cover the shows in New York City, Chicago, Boston and the other large metropolises. All cars and accessories exhibited will be described in detail and their prices will be given. In addition to these special num-

bers, the programme for the next few months contains several feature articles that will be of more than passing interest and value. One of these will have to do with the subject of motor vehicles in the agricultural industry. Its facts and illustrations will be new and they will be presented in a manner that will create new interest in the subject. All of the articles will be topical and authoritative.

Partial Table of Contents.

	Page
*Stealing Cars a Big Business.....	13
*Export Sales Doubled Last Year.....	21
*General News of the Industry.....	23
*Contractors' Special Truck Body.....	26
*Motor Starting and Car Lighting.....	27
*Motor Buses in Honolulu.....	31
*Empire Models for 1916.....	33
*The Madison Six—Chassis Detail.....	37
*The C. G. P. Special Light Weight Car..	39
*Practical Motor Car Repairs.....	41
*Suggestions for the Ford Car Owner....	43
The Auto and the R. F. D. Routes.....	47
*Ford Car Accessories and Equipment...48	
*Industrial Happenings and Comment...50	
*Exports to Neutral Countries.....	51
*Car Accessories and Equipment.....	52
*Practical Facts for New Car Owners....54	

*Indicates article is illustrated.

What Quality Do You Want in the Car You Buy?

IF YOU WERE TO ASK US to state what, in our opinion, is the strongest thing that can be said about the Reo product for next season, we would say without a moment's hesitation, "We have no new model to offer." None of the grief that you and we know is inseparable from a new and untried car, to face during the coming months.

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THIS YEAR OF ALL YEARS we are glad we have nothing radically new, nothing experimental—nothing even doubtful or questionable—to offer our hosts of friends.

OF COURSE WE CONSIDERED this matter from every angle. We are conversant—have been for months—with everything others were trying to do.

OUR ENGINEERS ARE JUST AS ALERT as others—just as enterprising and just as prone to experiment and to explore new and interesting fields. They enjoy working mechanical puzzles just as keenly as any. But—

MOST OF ALL WE CONSIDERED it from the standpoint of those thousands and thousands of friends who have learned to lean upon us, secure in the belief that we will offer them nothing but that of which we ourselves are sure.

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SO IF IT'S SERVICE you're looking for, then Reo is the car for you.

WHICH REO? Your preference and your purse must decide.

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(Yearly Advertisers Only Are Listed in This Guide.)

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Auto Parts Co., Providence, R. I.
Faw, J. H., Inc., 41 Warren St., New York City.

Times Square Auto Co., 56th St., at Broadway, New York City.

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Brunner Mfg. Co., Main Office and Factory, Utica, N. Y.; New York Office, Hudson Terminal Bldg., 30 Church St. (Brunner.)

Williams Foundry & Machine Co., Akron, O.

AIR PUMPS.

Gardiner Governor Co., 126 Williamson St., Quincy, Ill.

Lipman Air Appliance Co., 199 Pleasant St., Beloit, Wis. (Portable, Stationary.)

ANTI-RATTLERS.

King Specialty Mfg. Co., Brookline, Mass.

AUTOMOBILE ACCESSORIES.

Gemco Mfg. Co., 743 So. Pierce St., Milwaukee, Wis.

AUTOMOBILE PARTS.

Gemco Mfg. Co., 743 So. Pierce St., Milwaukee, Wis.

AUTOMOBILES. (See Cars.)

AUTOMOBILE SPECIALTIES.

Motor Specialties Co., Waltham, Mass.

AUTO SPRINGS. (Boltless.)

Harvey Spring Co., 851 17th St., Racine, Wis.

AXLES.

Russel Motor Axle Co., North Detroit, Mich. (Internal Gear Drive.)

BALLS AND BALL BEARINGS.

Ahlberg Bearing Co., 2624 Michigan Ave., Chicago; 1790 Broadway, New York City; 805 Woodward Ave., Detroit.

Boyd, F. Shirley, 175 Massachusetts Ave., Boston. (R. I. V.)

Marburg Bros., Inc., 1790 Broadway, New York. (S. R. O.)

New Departure Mfg. Co., Bristol, Conn. (New Departure.)

Norma Co. of America, 1790 Broadway, New York City. (Norma.)

BODIES—WOOD AND METAL.

Cotton, Inc., L. M., Boston, Mass.

Highland Body Mfg. Co., Cincinnati, O. (Highland.)

Springfield Metal Body Co., 20 Medford Ave., Springfield, Mass.

BOLTLESS AUTO SPRINGS.

Harvey-Spring Co., 851 17th Street, Racine, Wis.

BRAKE BANDING OR LINING.

Boyd, F. Shirley, 175 Massachusetts Ave., Boston. (Multibestos.)

Standard Woven Fabric Co., Framingham, Mass. (Multibestos.)

Staybestos Mfg. Co., Lena and Armat Sts., Germantown, Philadelphia, Penn. (Staybestos.)

Thermoid Rubber Co., Trenton, N. J.

BRUSHES, WIRE.

Williams Foundry & Machine Co., Akron, O.

CABLE, AUTOMOBILE.

Faw, J. H., Inc., 41 Warren St., New York City. (Standard American.)

Packard Electric Co., The, Warren, O.

CARBON REMOVERS. (See Cylinder Cleaning Compound.)

CARBURETORS.

Air-Friction Carburetor Co., Dayton, O. (Model C.)

Zenith Carburetor Co., Detroit. (Zenith.)

CARS—GASOLINE PLEASURE.

Inter-State Motor Co., 804 West Willard St., Muncie, Ind. (Inter-State.)

Metz Co., Waltham, Mass. (Metz.)

Nordyke & Marmon Co., Indianapolis. (Marmon.)

Peerless Motor Car Co., Cleveland, O. (Peerless.)

Pierce-Arrow Motor Car Co., Buffalo, N. Y. (Pierce-Arrow.)

Scripps-Booth Co., Detroit. (Scripps-Booth.)

Stutz Motor Car Co., Indianapolis. (Stutz.)

White Co., Cleveland, O. (White.)

Willys-Overland Co., Toledo, O. (Overland.)

Winton Motor Car Co., 131 Berea Road, Cleveland, O. (Winton.)

CARS—GASOLINE COMMERCIAL.

Bessemer Motor Truck Co., Grove City, Penn. (Bessemer.)

Chase Motor Truck Co., 106 West St., Syracuse, N. Y.

Duplex Power Car Co., Charlotte, Mich. (Duplex.)

Federal Motor Truck Co., Junction and Leavitt Sts., Detroit. (Federal.)

General Motors Truck Co., 26 Cadillac Ave., Pontiac, Mich. (GMC.)

Independent Motors Co., Port Huron, Mich. (Independent.)

International Motor Co., 64th St., and West End Ave., New York, N. Y. (Mack.)

Jeffery Co., Thos. B., Kenosha, Wis.

Kissel Motor Car Co., 196 Kissel Ave., Hartford, Wis.

Packard Motor Car Co., Detroit, Mich.

Peerless Motor Car Co., Cleveland, O. (Peerless.)

Pierce-Arrow Motor Car Co., Buffalo, N. Y. (Pierce-Arrow.)

Sanford Motor Truck Co., Syracuse, N. Y. (Sanford.)

Signal Motor Truck Co., Detroit. (Signal.)

Sullivan Motor Car Co., Rochester, N. Y. (Sullivan.)

White Co., Cleveland, O. (White.)

CARS—ELECTRIC COMMERCIAL.

General Motors Truck Co., 26 Cadillac Ave., Pontiac, Mich. (GMC.)

General Vehicle Co., Long Island, N. Y.

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CHAINS—TRANSMISSION OR DRIVING.

Boyd, F. Shirley, 175 Massachusetts Ave., Boston. (Baldwin.)

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Heinze Electric Co., Lowell, Mass.

CONTROLLERS.

Pierce Speed Controller Co., Anderson, Ind.

CRANK HOLDERS.

King Specialty Co., Brookline, Mass. (King.)

CYLINDER CLEANING COMPOUND.

Dyer Apparatus Co., Cambridge, Mass. (Oxy-Carbon.)

ELECTRIC LIGHTING EQUIPMENT.

Carleton Co., The, 172 Summer St., Boston. (New Carleton No. 68.)

Culver-Stearns Mfg. Co., Worcester, Mass.; Detroit.

ELECTRIC TROUBLE SHOOTER.

American Bureau of Engineering, 1526 Wabash Ave., Chicago, Ill. (Ambu.)

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Manufacturers' Engine Company, Kansas City, Mo.

FAN BELTS.

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Housel Sales Co., B Street, Buffalo, N. Y.

FORD HOODS AND RADIATORS.

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Hunter Auto Supply Co., Hunter Bldg., 333 W. Madison St., Chicago, Ill. (Hunter.)

A. J. Picard & Co., 1720 Broadway, New York City. (Genemotor.)

Walden Mfg. Co., 73 Commercial St., Worcester, Mass.

FUNNELS, AUTO.

Dover Stamping & Manufacturing Co., Cambridge, Mass. (Dover.)

GAS ENGINES.

Manufacturers' Engine Company, Kansas City, Mo.

GASOLINE ENGINES.

Manufacturers' Engine Company, Kansas City, Mo.

GEARLESS DIFFERENTIALS.

Gearless Differential Co., 864 Woodward Ave., Detroit, Mich.

GEAR SETS.

Detroit Radiator Specialty Co., 961 Woodward Ave., Detroit, Mich.

GEARS, STEERING.

Ross Gear & Tool Co., 794 Heath St., Lafayette, Ind. (Ross.)

GENERATORS.

Carleton Co., The, 172 Summer St., Boston. (New Carleton No. 68.)

HEATERS.

Superior Mfg. Co., N. S. Pittsburg, Penn. (Superior Safe Garage.)

HORNS.

Faw, J. H., Inc., 41 Warren St., New York City. (Clero.)

Fitzgerald Mfg. Co., 101 Oliver St., Torrington, Conn. (Clero.)

Seiss Mfg. Co., 444 Dorset St., Toledo, O.

HOSE CLAMPS.

Faw, J. H., Inc., 41 Warren St., New York City. (Ideal.)

IGNITION ASSEMBLIES.

Faw, J. H., Inc., 41 Warren St., New York City.

INSULATION.

Packard Electric Co., The, Warren, O.

JACKS.

Motor Specialties Co., Waltham, Mass. (Excel Auto.)

KEROSENE ENGINES.

Manufacturers' Engine Company, Kansas City, Mo.

LAMPS.

Faw, J. H., Inc., 41 Warren St., New York City.

Mabey's Electric & Mfg. Co., Indianapolis. (Mabey's Electric Trouble.)

Mueller & Co., R. S., 431 High Ave., S. E., Cleveland, O. (Clamp.)

LIGHTERS, CIGAR.

Mabey's Electric & Mfg. Co., Indianapolis. (Mabey's Electric.)

BUYERS' REFERENCE and GUIDE—Continued.**LIGHTING SYSTEMS, ELECTRIC.**

Carleton Co., The, 172 Summer St., Boston. (New Carleton No. 68.)

Faw, J. H., Inc., 41 Warren St., New York City. (Culver Stearns.)

Hawthorne Mfg. Co., Inc., 5 Spruce St., Philadelphia, Penn. (Spotlights, Marine Searchlights, Pencil Flashlights.)

Xcel-O-Lyte Co., 1200 Xcelo Bldg., Newton, Ia.

LIGHT PROTECTORS.

Faw, J. H., Inc., 41 Warren St., New York City. (Lennon.)

LUBRICANTS.

Dixon Crucible Co., Jos., Jersey City, N. J. (Graphite.)

Eagle Oil & Supply Co., 104 Broad St., Boston. (Eagleline No-Karbon.)

Harris Oil Co., A. W., 326 So. Water St., Providence, R. I.; 143 No. Wabash Ave., Chicago. (Harris.)

New York & New Jersey Lubricant Co., 165 Broadway, New York. (Motorol, Non-Fluid, Kejex.)

Standard Oil Co., New York. (Polarline.)

Texas Company, 17 Battery place, New York City. (Texaco.)

Vacuum Oil Co., Rochester, N. Y. (Gargoyle Mobiloil.)

Valvoline Oil Co., 27 State St., Boston. (Valvoline.)

MAGNETO COVERS.

Heinze Electric Co., Lowell, Mass.

MAGNETOS AND SUPPLIES.

Bosch Magneto Co., 223-225 W. 46th St., New York.

Eisemann Magneto Co., 32 33d St., Brooklyn, N. Y.

Marburg Bros., 1790 Broadway, New York. (Mea.)

Splitdorf Electrical Co., 98 Warren St., Newark, N. J.

MAILING LIST.

Trade Circular Addressing Co., 166 W. Adams St., Chicago.

MEASURES.

Dover Stamping & Manufacturing Co., Cambridge, Mass. (Auto and Savol.)

MOTORS.

Auto Parts Co., Dept. T, 737-739 W. Jackson Blvd., Chicago, Ill. (Michigan.)

Wisconsin Motor Mfg. Co., Milwaukee, Wis.

PATENT ROCKING FIFTH WHEEL.

Martin, C. H., 293 Bridge St., Springfield, Mass.

PISTON RINGS.

Featherweight Piston Company, 11 Guyman Way, Pittsburg, Penn.

McQuay-Norris Mfg. Co., Dept. D, St. Louis, Mo. (Leak-Proof.)

PISTONS, ALUMINUM ALLOY.

Featherweight Piston Co., 11 Guyman Way, Pittsburg, Penn.

PRESSES. (See Arbor Presses.)**PUMPS, VALVE.**

Hill Pump Valve Co., Chicago, Ill.

RADIATORS.

Rome-Turney Radiator Co., Rome, N. Y. (Helical Tube.)

RADIATOR CEMENT. (See Cements.)**RADIATOR & HOOD COMBINATIONS.**

Superior Lamp Mfg. Co., 136 W. 52nd St., New York, N. Y.

REANERS.

Harding Distributing Co., Boston. (Martell Aligning.)

REAR APRONS FOR FORDS.

Housel Sales Co., B Street, Buffalo, N. Y. (Gibmill.)

RINGS. (See Piston Rings.)**ROAD BUILDING MATERIALS.**

Barrett Manufacturing Co., New York. (Tarvia.)

ROLLER BEARINGS.

Hyatt Roller Bearing Co., Detroit. (Hyatt.)

Norma Co. of America, 1790 Broadway, New York City. (Norma.)

SEATS.

Auto Parts Co., Dept. T, 737-739 W. Jackson Blvd., Chicago, Ill. (Racing.)

SELF-STARTERS. (See Motor Starters.)**SHOCK ABSORBERS AND SUPPLEMENTARY SPRINGS.**

Boyd, F. Shirley, 175 Massachusetts Ave., Boston. (Sager Peerless.)

Hartford Suspension Co., 147 Morgan St., Jersey City, N. J.

SPARK PLUGS AND IGNITERS.

Bosch Magneto Co., 223-225 W. 46th St., New York.

Faw, J. H., Inc., 41 Warren St., New York City. (Red Seal.)

Gibson-Hollister Mfg. Co., Boston, Mass.

Hartford Machine Screw Co., 512 Capitol Avenue, Hartford, Conn. (Master.)

Heinze Electric Co., Lowell, Mass.

Milwaukee Auto Specialty Co., 705-711 Chestnut St., Milwaukee, Wis. (Centerfire.)

Splitdorf Electrical Co., 98 Warren St., Newark, N. J.

Superior Motor Power Company, 24 Irving Place, New York City.

SPEEDOMETERS.

Standard Thermometer Co., Boston, Mass.

SPRING OILERS.

Housel Sales Co., B Street, Buffalo, N. Y.

SPRINGS FOR AUTOMOBILE SUSPENSION.

Marburg Bros., Inc., 1790 Broadway, New York. (Marburg-Hagen.)

Tuthill Spring Co., 756 Polk St., Chicago. (Titanic Unbreakable.)

SPROCKETS.

Boyd, F. Shirley, 175 Massachusetts Ave., Boston. (Baldwin.)

TEST CLIPS.

Mueller & Co., R. S., 431 High Ave., S. E., Cleveland, O. (Universal.)

THERMOS CASES.

Dover Stamping & Manufacturing Co., Cambridge, Mass.

TIMERS.

Motor Specialties Co., Waltham, Mass. (Bemus.)

TIRE CHAIN GRIPS. (See Chains.)**TIRES, CASINGS AND INNER TUBES.**

Federal Rubber Mfg. Co., Milwaukee, Wis. (Federal.)

Goodyear Tire & Rubber Co., Madison St., Akron, O.

TIRE TOOLS.

Housel Sales Co., B Street, Buffalo, N. Y.

TOPS AND ATTACHMENTS.

Highland Body Manufacturing Co., Station P, Cincinnati, O. (Highland Coupe.)

Springfield Metal Body Co., 20 Medford Ave., Springfield, Mass.

TRACTORS.

Knox Motor Associates, Springfield, Mass. (Knox.)

TRANSFORMERS.

Packard Electric Co., The, Warren, O.

TRUCKS AND TRACTORS. (See Cars, Commercial.)**VALVE GRINDING COMPOUND.**

Faw, J. H., Inc., 41 Warren St., New York City. (Eureka.)

VALVE TOOLS.

American Valve Tool Co., 589 Hudson St., New York, N. Y.

VIBRATORS.

J & B Mfg. Co., Pittsfield, Mass.

VULCANIZERS.

Mabey's Electric & Mfg. Co., Indianapolis. (Mabey's Electric.)

Vanderpool Co., Springfield, O.

Williams Foundry & Machine Co., Akron, O.

WARNING SIGNALS.

Seiss Mfg. Co., 444 Dorr St., Toledo, O.

WELDING OUTFITS.

Dyer Apparatus Co., Cambridge, Mass. (Dyer.)

Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill. (Oxyacetylene Combination Outfit.)

Prest-O-Lite Co., Indianapolis, Ind.

Searchlight Co., 1012 Karpen Bldg., Chicago, Ill.

Waterhouse Welding Co., 3 Pelham St., Boston, Mass.

WRENCHES AND COMBINATION OUTFITS.

Coes Wrench Co., Worcester, Mass.

Faw, J. H., Inc., 41 Warren St., New York City. (Walden.)

Lane, Will B., 180 No. Dearborn St., Chicago. (Unique Ratchet.)

Mossberg Co., Frank, Attleboro, Mass.

Walden Mfg. Co., 73 Commercial St., Worcester, Mass.

Show Issues *Automobile Journal*

NEW YORK

Held December 31 to January 8

ADVANCE NUMBER

December 25 issue

REVIEW

January 10 issue

CHICAGO

Held January 22 to January 29

ADVANCE NUMBER

January 20 Issue

REVIEW

February 10 issue

BOSTON

Held March 4 to March 11

Display of Pleasure and Commercial Cars

ADVANCE NUMBER

February 28 Issue.

REVIEW

March 10 Issue.

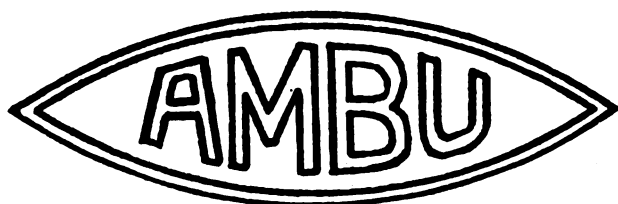
Great Shows——Great Editions

Make Your Space Reservations

AUTOMOBILE JOURNAL

TIMES BUILDING

PAWTUCKET, R. I.



Electrical Trouble Shooter

It accurately, automatically and mechanically locates electrical starting and lighting trouble of any sort on any automobile and gives the remedy for it.

When a customer comes into your repair shop with some mysterious trouble in an electric lighting or starting system with which you have had no experience, do you have to say to him: "I can't handle the job—I don't know enough"?

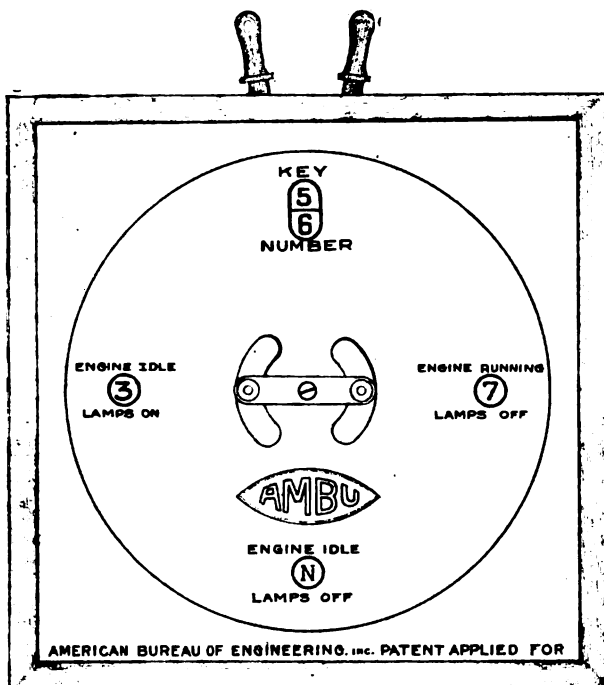
Do you dread these electrical jobs because of the weary hours of fussy testing with voltmeters and ammeters, which may end with the confession, "I can't find the trouble"?

Would it help to know the location and adjustment of cutouts, regulator and relays, the equipment of meters, switches, clutches, battery and so on.

The makers of electrical starting and lighting systems turn out over sixty different types of apparatus which are installed on different cars in numberless different ways. Each system has no less than 250 possibilities for trouble when in use.

It is impossible for any repairman to know all the kinks in all these systems. If he did know them he would be the highest priced of high-priced men, and no garage operator could afford to employ him.

But now you can easily and surely have this information and be able to make any and all electrical repairs, and on any and all systems made to date. Information concerning all new systems and changes is furnished promptly.



AMBU Electric Trouble Shooter

is operated in connection with charts and repair instructions covering every electrical system in use, and its installation on every car. It enables any repairman to locate electrical troubles at once and gives him explicit directions as to repairs. It is an automatic repairman.

It finds the trouble in a minute and tells him just what to do. The instrument, with a dial face, is installed between the battery and the battery cable. It is read with the engine idle and lights off, then with engine running and lights off, and last with engine running and lights on. Each reading gives the repairman an index number which refers him to the chart. These charts describe the trouble and tell him just what to do. Diagrams of the different wiring systems are furnished.

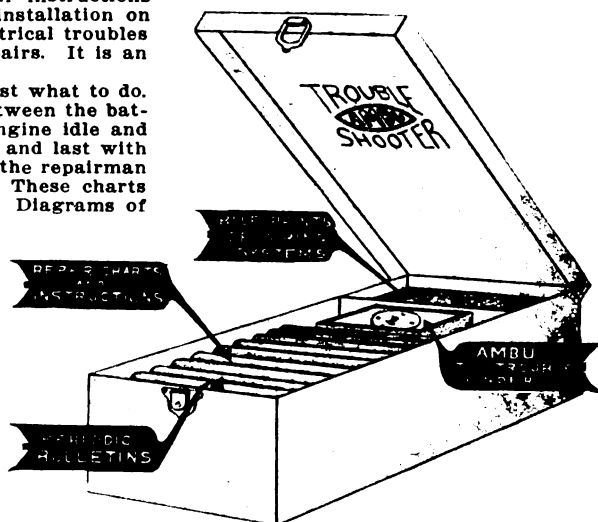
The system will save hours of time for the most competent man. It makes expert repairs possible with or without expert knowledge. No repairman equipped with it need be afraid to accept any job.

SELLING REPRESENTATIVES WANTED.

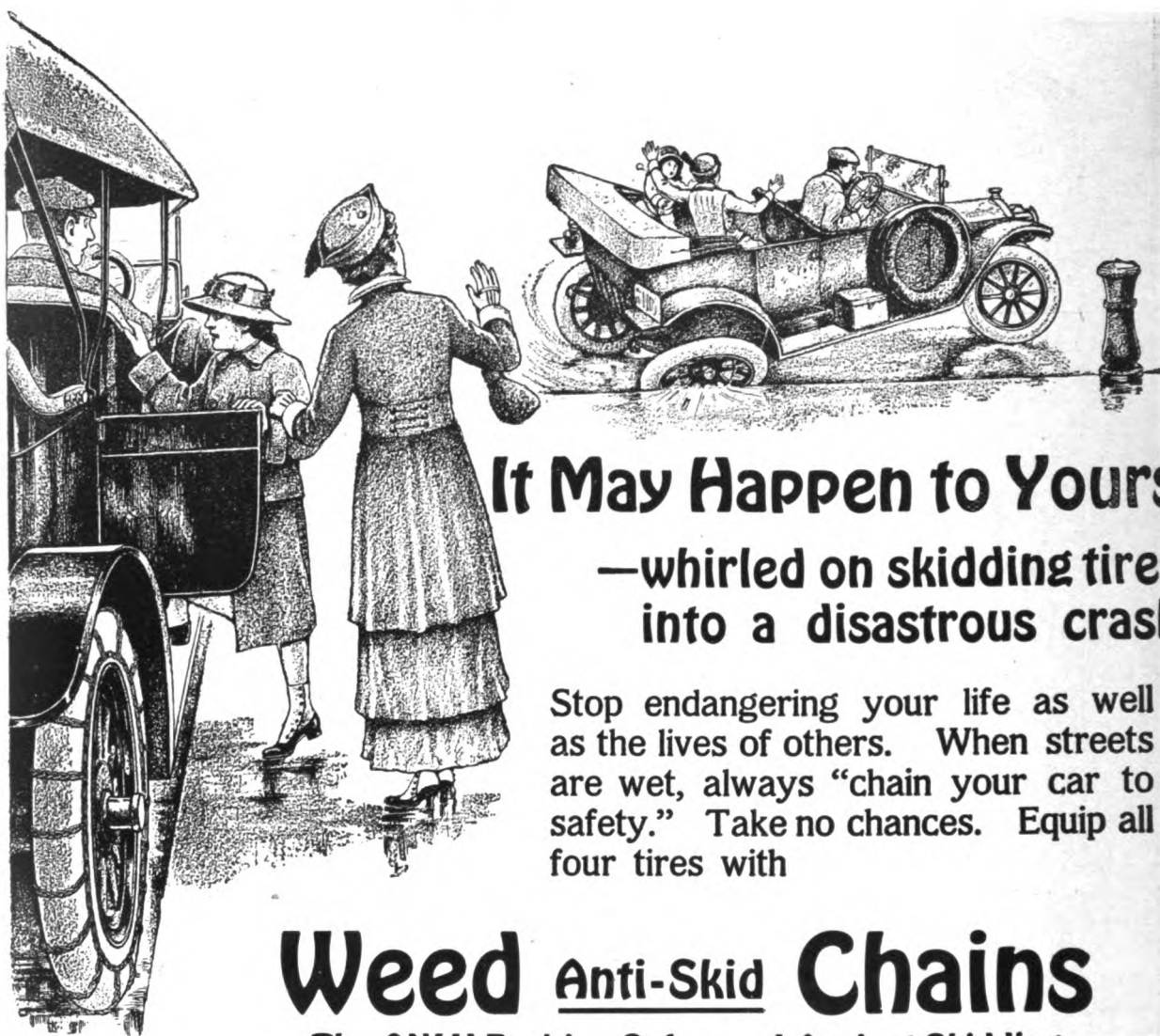
The Ambu Trouble Shooter is simple, practical and positive. Complete and sold with a guarantee of the efficiency claimed.

Detailed information at request. Write today.

The American Bureau of Engineering
1022 Wabash Avenue, CHICAGO, ILL.



(When Writing to Advertisers, Please Mention The Automobile Journal.)



It May Happen to Yours
 —whirled on skidding tires
 into a disastrous crash

Stop endangering your life as well as the lives of others. When streets are wet, always "chain your car to safety." Take no chances. Equip all four tires with

Weed Anti-Skid Chains

The ONLY Positive Safeguard Against Skidding

Safety demands that all tires be equipped with Weed Chains. It doesn't require the gift of second sight to see why this is true. Rubber slips—never grips. It slides on wet pavements and roads like a cake of soap on the moistened hands.

Rubber lacks the bite-and-hang-on ability to prevent skidding, while Weed Chains hold on like a bull dog, prevent side-skid and drive slip. Equip both front and rear tires with Weed Chains. Do it today—before it's too late.

SOLD FOR ALL TIRES BY DEALERS EVERYWHERE

Weed Chain Tire Grip Company, . . . Bridgeport, Conn.

Also manufacturers of Motorcycle Tire Chains and Dobbins Blow-Out Chains



(When Writing to Advertisers, Please Mention The Automobile Journal.)

STEALING motor cars has proved so profitable and comparatively safe a business that it has attracted a large number of expert criminals. The number of cars stolen is mounting rapidly in every city of the country, in spite of the best efforts of the police. The insurance companies have been forced to adopt very high rates for theft insurance and they have even considered the discontinuance of such insurance entirely.

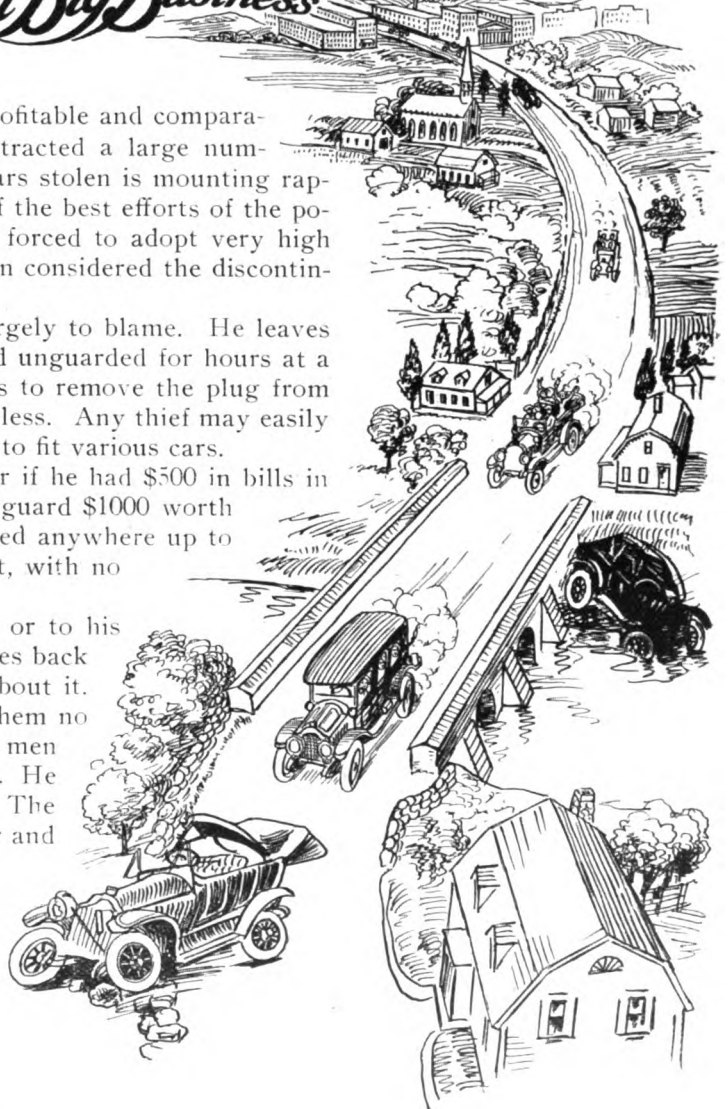
For this condition the car owner is largely to blame. He leaves his car standing on the street unlocked and unguarded for hours at a time. In most cases his only precaution is to remove the plug from his coil box. That precaution is next to useless. Any thief may easily equip himself with a variety of these plugs to fit various cars.

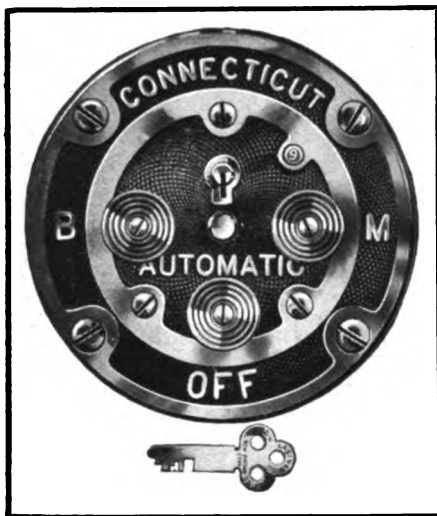
The owner who would carry a revolver if he had \$500 in bills in his pocket, or hire a safety deposit box to guard \$1000 worth of securities, will leave an automobile valued anywhere up to \$3000 or \$4000 standing on the open street, with no protection at all.

He goes to a theatre for the evening, or to his office for a half day's work. When he comes back the car is gone and that is all he knows about it. He reports to the police, but he can give them no information whatever. He did not see the men who took the car and cannot describe them. He does not know when the car was taken. The best he can do is to give the license number and perhaps the car and motor numbers.

The wise thief usually selects for his operations a car that is in no way peculiar in appearance. He prefers a make or model that is numerous in the town. So it is like looking for the proverbial needle in a haystack to attempt to locate the stolen machine.

The thief is usually well dressed. He



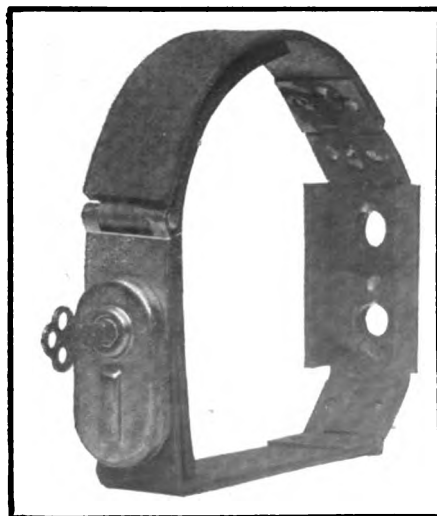


Connecticut Ignition Coil Lock.

of cases the thief attracts so little attention that it is impossible later to get a description from witnesses that will prove of any use.

Once he has the car the thief promptly changes the license number and drives it to a "fence," which is usually a garage in a town some distance away. Here elaborate measures are taken to disguise the car. The body may be taken off and a body of another type substituted. The motors of two stolen cars may be interchanged. Gas lights may be changed for electric, or vice-versa. Wire wheels may be substituted for wood, and the whole may be repainted. Especial attention is paid to scratches, dents and injuries resulting from slight accidents by which an owner might be able to identify his property.

With a punch chisel and a hammer, the motor and car numbers are altered. A skillful workman can change a one into a seven, nine or four;



Sty Tire Holder and Lock.

approaches the car with confidence, cranks it up and drives off as if it were his own. Bystanders naturally assume that he owns it and no attention is paid to him. Police have found that in an overwhelming majority

possible to determine what the original numbers were. After a car has been given a clever course of treatment of this kind, it often happens that the owner himself cannot recognize it. In fact, this possibility of disguising a car makes automobile theft easier than almost any other sort. The old horse thief could dye the animal, but the dye would shortly wear off. There are few other sorts of property that lend themselves so rapidly to disguise as automobiles. The insurance companies are more concerned over car thefts than almost any other interest, and they follow the business closely and make a careful study of the methods employed. They have reason to believe that all over the country well organized gangs are operating. It has been noticed, for instance, that in New England cars stolen in Boston have been frequently discovered in Providence and Worcester, and cars stolen in Providence turn up in New London or Boston. The "fence" is quite usually a second-hand car dealer with whom the thieves work. He has a repair shop, where the necessary alterations may be made, and his business makes it possible for him to dispose of the stolen cars. The great increase in the number of thefts has naturally caused such places to be watched carefully. An inspection of the stock by a skillful policeman, who has specialized on automobile thefts, will usually uncover something suspicious in the appearance of a stolen car, and on the basis only of suspicion the police have a right to order the garage owner to hold a car for a certain length of time until they can make an investigation, or they can take the car from him

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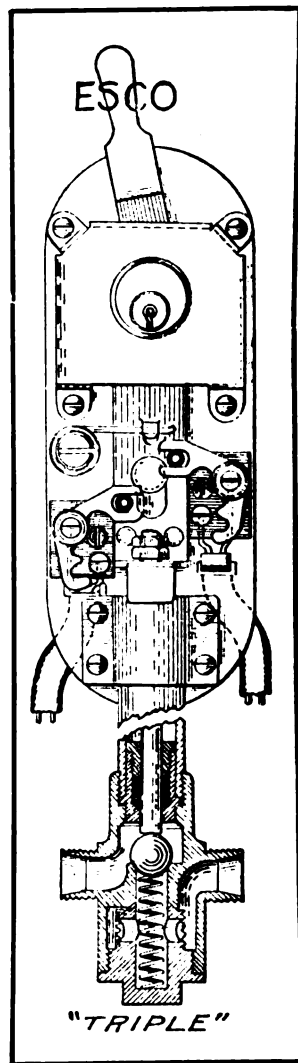
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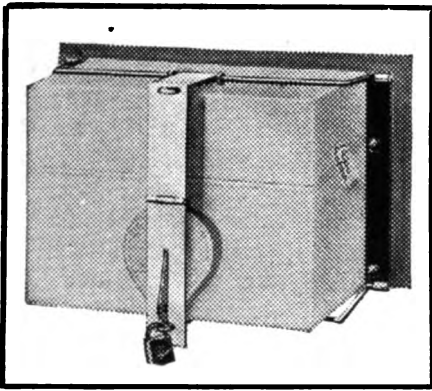
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Esco Battery, Magneto and Fuel Lock.



New Era Switch Coil Lock.

while they look up its antecedents.

For that reason such cars are not kept in the garage. One or two cars of legitimate past are kept on display and the dealer advertises

The automobile insurance companies have men who are thoroughly familiar with these serial numbers. They know the

numbers that have been used on every make and model during a given time. When the new owner of a stolen car registers it in the state where he lives he gives car and motor numbers. These registrations are scrutinized closely by the insurance companies and if one appears on the list that is not in the range of numbers known to have been used by the maker of the car, an investigation is begun at once and this leads often to the apprehension of the thieves and the discovery of the "fence."

Every insurance company writing automobile theft insurance employs a private detective agency to run down the motor car thieves that cause its losses. Up to this time these different agencies have operated separately. It often happens that in its work an agency may discover the theft of cars covered by some other insurance company than the one by which it is employed. In that case the other company pays for the investigation and takes advantage of the facts that have been discovered.



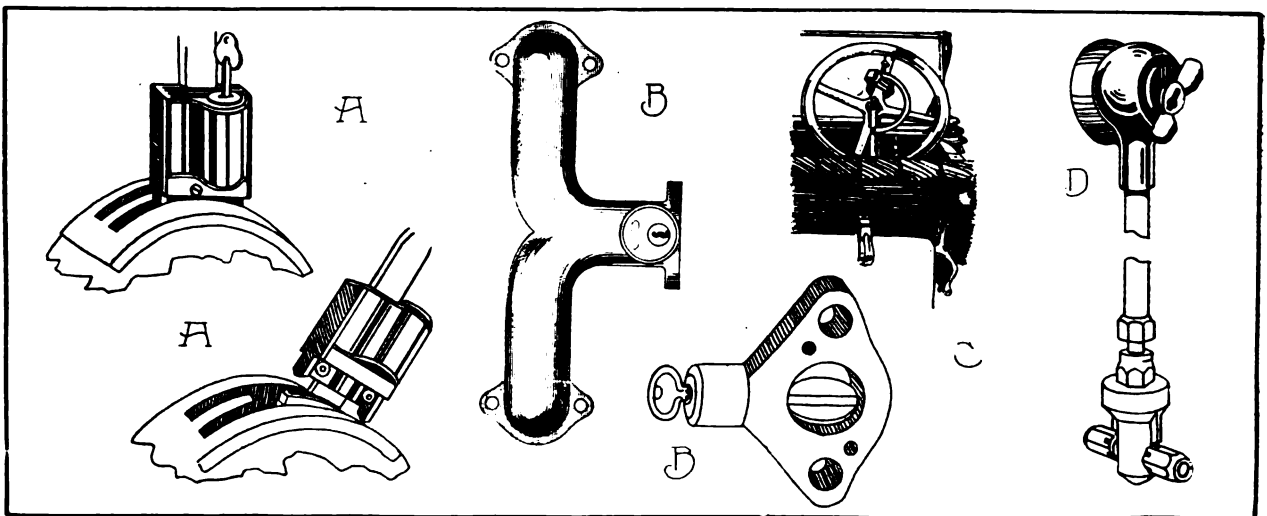
License Plate Theft Detector.

used cars for sale. A customer calls and the dealer asks him what sort of a car he wants. The customer describes his desires and the dealer says, "Well, I haven't anything like that just now, but I expect to have one tomorrow," and he takes the customer's name and address.

Probably the next evening after dark he will arrive at the prospective buyer's home with the explanation that the car has just come in and that he thought he would bring it out at once for inspection. If it looks good, and it usually does for the price asked, the deal may be closed at once. There is, of course, a minimum of opportunity for the police to observe such sales.

Serial Number a Stumbling Block.

There is one feature of the matter, however, that makes the detection of such transactions possible, and it is to this that most of the arrests and convictions which are made is due. When a car comes from the factory it and the motor installed in it have serial numbers attached.



A, the Safety Auto Lock; B, the Parkin Manifold Lock; C, the Backus Utility Auto Lock; D, the Gasolock.



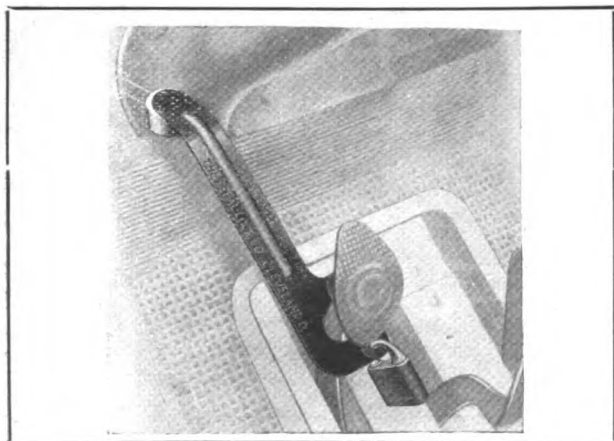
New York Coil Switch and Lock.

This same board has charge of the adjustment of rates. There has been a great deal of discussion in automobile insurance circles during the past year or two regarding the future of the business and the idea of abandoning it entirely in view of the large number of losses has been discussed.

Some idea of the amount of the business is indicated by the fact that in Philadelphia alone 208 cars have been stolen in the last three months. Fifty-eight arrests have been made and of these persons 51 have been convicted. This is an exceptionally good record for police efficiency.

According to a report recently made at the annual meeting of the Automobile Protective and Information Bureau in Chicago, 326 cars were stolen in that city during the past year and 193 in the bureau's territory outside the city. Of the Chicago cars 145 were recovered, and of those outside 76. In Chicago 210 Ford cars were reported to the bureau as stolen and 88 were recovered. Outside of the city 106 Fords were stolen and 37 recovered. The report makes a point of the unusual difficulty of identifying a Ford car.

In their work the police have recourse to the



The Pedal Lock for Ford Cars.

There is to be a meeting of the National Automobile Insurance board this fall, at which a large annual appropriation will be passed to employ a single, large, well-organized detective agency to look after all motor car thefts in all parts of the country, just as the bankers now protect themselves.

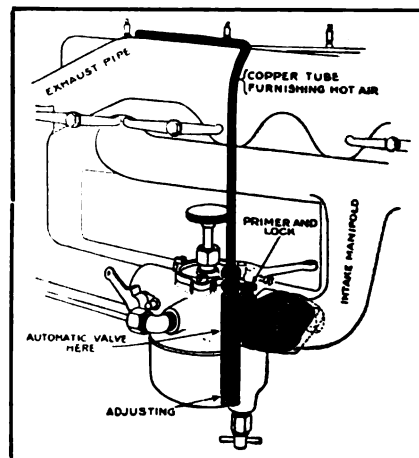
same methods as the insurance companies, but as their jurisdiction is confined to one city, and the cars are most frequently taken to other towns, they have not as good an opportunity to land the thieves.

Precautions Are Possible.

Thefts on such a scale would be impossible if owners took even elementary precautions. It is very common to see expensive fur coats left in a car on the street during the winter and the car left unguarded. Such carelessness exists almost nowhere else.

The reason, in the opinion of the insurance men, is that the car and its contents are insured against theft, and the owner feels that whether or not it is stolen he will be protected. But it is an attitude that is quite likely to either rob him of the possibility of insurance protection entirely or to meet a rate of an almost prohibitive figure.

The ordinary theft could very easily be prevented by the owner. There are on the market a great variety of locking devices that would make the theft of a car practically impossible. These are wheel locks, ignition lock, crank locks and so on. A good ignition lock can be bought very cheaply, and it makes it impossible to operate the car without completely rewiring the motor.



The Mix-O-Lock and Fuel Saver.

It is possible also by taking considerably more trouble to protect a car against theft on a city street without a lock. The spark plug terminals can be removed, wires may be disconnected from the battery, the gas shut off and other measures taken which will prevent the starting of the car and give even an expert, who does not know exactly what is the matter, a good deal of work before he can get the car moving. Thieves do not like to linger over their loot. They prefer something they can get away with quickly.

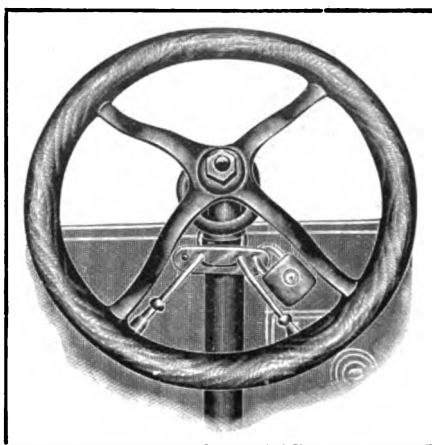
In spite of the great number of thefts, there has been very little demand for the excellent protective devices that are offered. The number sold is hopelessly out of proportion to the usefulness of the devices.

Representative locks made in this country are shown in the pages of this article. Considered sequentially, the first is the Connecticut automatic ignition coil lock, made by the Connecticut Telephone and Electric Company, Meriden, Conn. It fits to the inside of the switch plate on the Connecticut coil, and is locked by pressing a small button located over the magneto button on the outside of the plate. A key, no two of which are alike, is used to unlock the device.

The next illustration is that of the Sly tire holder lock, manufactured by the W. W. Sly Manufacturing Company, Cleveland, O. It is especially designed for Willys-Overland, Reo and Dodge cars. The locks are provided with two keys and are absolute preventatives against theft. The holders are made for one and for two tires, the latter having a partition to prevent the tires chafing.

A triple locking device which simultaneously locks the battery, magneto and the gasoline supply is shown. It is made by the Esco Manufacturing Company, Detroit, and is operated by a lever for locking purposes and is unlocked by a key. The ignition is locked through the operation of a double switch, and the gasoline supply by driving a plunger into the valve in the gasoline feed line. All levers are controlled or operated by what is known mechanically as the "one member movement." In the valve construction is used a ball check valve, the ball seating on the lower as well as the upper bases or beds. The lower bed shuts off the gasoline supply, while the upper prevents leakage of gasoline under pressure, it being the base of the stuffing box through which the plunger passes. The device also in-

cludes a strainer with capacity $2\frac{1}{2}$ times greater than that of the average carburetor. The lock is installed on the heel board or riser of the front seat, which compels a thief to either

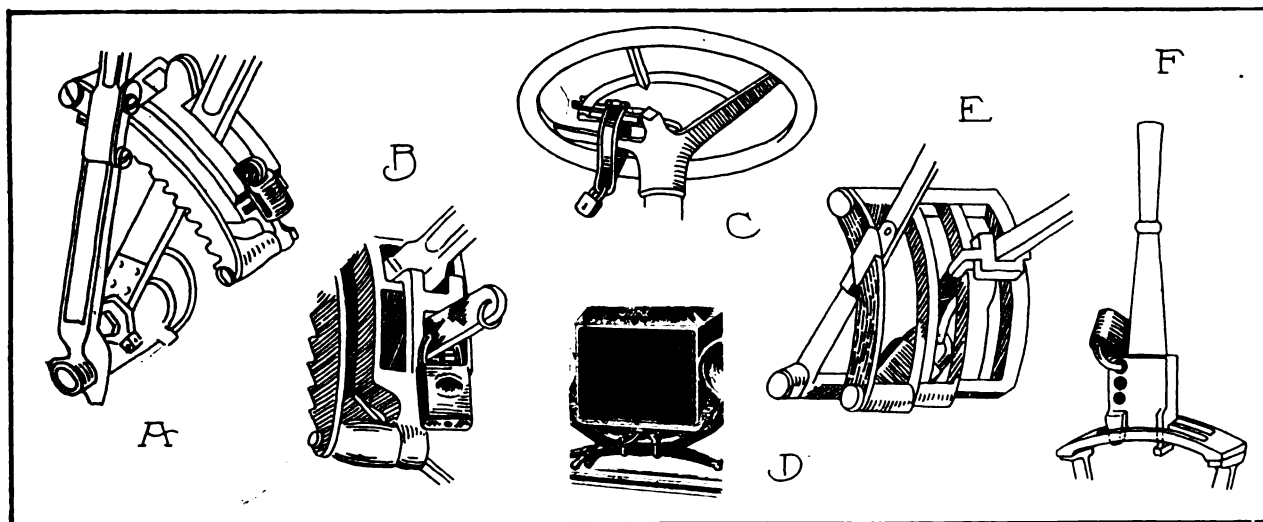


The Clinton Handcuff Lock for Ford Cars.

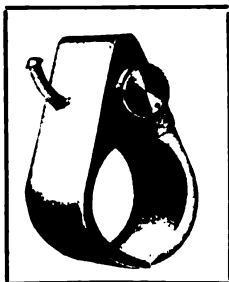
crawl under the car or to tear up the floor boards to trace out the wiring of the car.

The combination switch coil lock manufactured by the New Era Spring and Specialty Company, Detroit, is designed for the protection of Ford cars. It will fit any car of that make equipped with the metal coil box. As can be seen in the illustration a foldable metal strap passes over the coil box and over the switch key, and is held in place by a strong and neat padlock. It is impossible when the strap is in position to either turn the key or to raise the cover of the box.

While the device shown in the next illustration is not a lock, it still can be called a preventative of theft because it serves as a tag to the public that the car is being operated by an unauthorized person. It is made by the Janney, Steinmetz Company, Philadelphia, and consists of a



A, Parker Gear Shift Lever Lock; B, the Fetterlock; C, Watchdog for Throttle and Spark Levers; D, Bridges Ford Crank Lock; E, Crown Gear Shift Lever Lock; F, Commercial Auto Lock.



Guardian Robe Lock.

practically indestructible tag, which is locked by tumble or padlock over the license plate by the owner when he leaves the car. This conceals the license number and if the car is driven through the streets in that manner the attention of every policeman would be directed to the violation of the law. If desired, the words "Stolen Car" are painted on the tag. The tag is weather proof.

In the first group of sketches four locking devices for a variety of purposes are shown. The first two, indicated by A, are of the safety auto lock, made by the Safety Tire Lock Company, Pawtucket, R. I. The first illustration shows the lock mounted on a starting lever which is locked and has the key in position. The locking operation consists of pushing the slide down either by hand or foot when the lever is in neutral. The extensions of the slide enter the opening of the lever plate and forestall any movement until it is unlocked. The key hole is dust proof and no two keys supplied are alike. The second sketch shows the lever unlocked. Note the bolts holding the attachment to the lever, which are covered by the slide when locked and are inaccessible.

Sketch B shows two views of the Parkin manifold lock, the product of Parkin & Son, Philadelphia. This device prevents the mixture from entering the engine when locked, and also prevents back firing. The only way by which a car can be moved from the place where the owner left it is by pushing or towing, and this the automobile thief is not prone to do. He is apt to be questioned by policemen. One great advantage of this device is that it prevents chauffeurs from taking unwarranted rides and prevents garage washers and polishers from starting the machine while under their care.

The Backus utility auto lock shown at C, made by the Backus Novelty Company, Southport, Penn., consists of an indestructible lock of hardened steel. Its jaws open to $4\frac{1}{2}$ inches, a ratchet arrangement allows locking in any position, and it snaps on instantly. The teeth are rounded to avoid tearing the material of whatever it is holding. Its possibilities for service are very wide; it can be used to lock the throttle and spark lever on a Ford car in the manner suggested in the illustration; to lock robes, coats, etc., to the coat rail, a suit case to the foot rail, and for a large number of other purposes. It is locked with a not easily duplicated key.

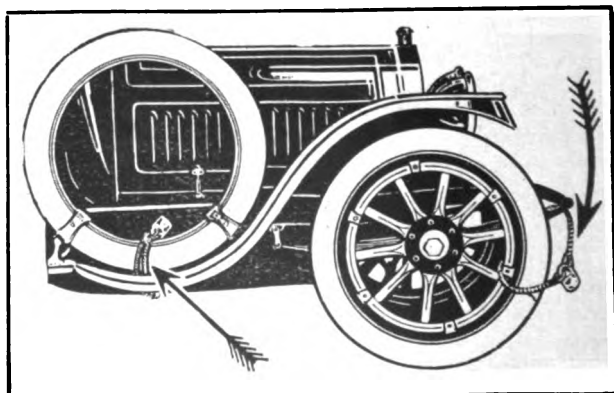
The Gasolock presented at D is marketed by the Gasolock Sales Company, Detroit. It comprises a Yale cylinder lock enclosed in a brass head or ball connected by a tube to a valve inserted in the line between the gasoline tank and carburetor. The cylinder lock is gear meshed with the stem of the valve in such a manner that the operation of the key locks and unlocks the fuel supply. It is bolted to the dash, and in locking the gasoline every portion of the Gasolock is locked. It is maintained that it cannot be shaken off or removed in any other way without first working the lock.

The kick switch with Yale lock, sold by the New York Coil Company, 338 Pearl street, New York City, is the standard New York switch, equipped with a Yale lock. By giving the key a single turn the ignition circuit is locked in the "on" or "off" position.

The pedal lock for model T Ford cars incorporates the use of a movable arm secured by a concealed bolt to the base of the steering column, which clamps the clutch pedal in neutral. There it is held secure by a padlock. This device is offered by the Pedal Lock Company, Cleveland.

Another lock designed especially for Ford cars is the Mix-O-Lock, made by the National Motor Supply Company, Cleveland. It is maintained to save at least 25 per cent. of the fuel and to eliminate carbonization, as well as locking the car at the carburetor. Its operating principle is shown in the accompanying illustration.

The Guardian robe lock, manufactured by the Mechanical Products Company, Cleveland, operates by combination and requires no keys. Its purpose is to securely lock garments, robes, gloves, packages, etc., to convenient parts of the car. It is $3\frac{3}{4}$ by $2\frac{1}{4}$ inches when closed. The jaws are $1\frac{3}{4}$ inches wide and lock in any position. The lock is made of heavy sheet steel, nickel plated.



The Powersteel Autowlock Securing Tires and Wheel.

The Clinton Ford handcuff is probably the simplest little lock of its kind on the market. In application the spark and throttle levers are brought together, and then "handcuffed," as shown in the illustration. The device is locked by padlock. It is made of steel and is nickel plated.

In the second group of sketches the Parker lock is shown at A. This is a supplemental device, made by the General Utility Company, Philadelphia, for insertion at the quadrant to lock the gear shifting lever. The attachment is hinged so as to slip around the lever when in neutral, and locks by means of a Yale lock.

The Fetterlock, shown at B, comprises a small bent plate that is slipped over the quadrant, this having an opening for receiving a lip with a small hole in it. In practise the lever is placed in neutral, the plate and lip inserted and the whole secured by a padlock slipped through the hole in the lip and locked by either a Corbin or Yale tumbler lock. It is made by the Autolock Company, Pittsburg, Penn.

The Watchdog, made by S. Breakstone, 1712 Michigan avenue, Chicago, and shown at C, consists of a pair of hinged arms that are slipped around the steering wheel spider and the throttle and spark levers. Even though the engine is left running, when locked the car can run only in a circle.

The Bridges Ford lock, offered by the Cochran Pipe Wrench Company, Chicago, and illustrated at D, comprises a special Corbin padlock with shackle, and is designed to be slipped around the starting crank securing it to the car frame.

Another device for locking the gear shifting lever is shown at E. It is the Crown, made by the Wiener-Barnet Company, Newark, N. J. It consists of a padlock and a notched bar. The latter is fitted around the lever when in neutral and is secured by padlock, which can be seen underneath the quadrant in the sketch. It is inserted through a hole at the bottom of the bar.

At F is shown the Commercial Manufacturing Company's (Cleveland, O.) auto lock. The gear shift is positively locked in neutral by inserting a strong metal yoke, whose extensions pass through the slides of the quadrant. It is impossible to connect the engine with the driving mechanism. Locking is by padlock.

The Powersteel Autowlock, offered by the Broderick & Bascomb Rope Company, St. Louis, consists of a length of steel wire rope covered with a practically indestructible fabric and a padlock. As seen in the illustration, it can be used to lock the front wheels to the car frame or

springs, as well as to secure tires to their carriers. The whole device weighs less than a pound, and tests have shown that the strongest wire slippers cannot clip Autowlock.

BAY STATE GET-TOGETHER DINNER.

The annual get-together dinner of the Bay State Automobile Association will be held this year at 6:30 p. m., Nov. 2, at the Hotel Lenox, Boston, and all members are invited thereto. It is expected that a record gathering will assemble.

The entertainment committee, of which R. T. Green is chairman, has provided for a menu that "will please the most fastidious appetite," and arranged a vaudeville programme and a series of speeches by several good speakers. The dinner falling on election night, the committee has arranged with a leading newspaper to supply the election news without delay in transmission.

In addition to Chairman Green, the entertainment committee is made up of J. J. McNamara, Walter H. Williams, Walter Bliss and J. T. Sullivan. The officers of the association are George W. McNear, president; J. J. McNamara, vice president, and Fred K. Swett, secretary-treasurer.

SHOCK ABSORBERS OF RACE CARS.

Authorities on automobile mechanics declare that the steep corner banking of the Sheepshead bay speedway, where the Astor Cup race was run on Oct. 9, is responsible for the many broken connecting rods reported. The angular thrust was terrific. Half the length of the course is banking and the other half level stretch.

It is interesting to motorists in general to note that all the eight cars that finished "in the money" were equipped with Hartford shock absorbers, both front and rear, and consequently did not suffer broken springs or frames. The maker of Hartford shock absorbers believes if it were possible to provide shock absorbers for connecting rods, none would have been broken.

INDIANAPOLIS RACE 300 MILES.

Carl Fisher, president of the Indianapolis speedway company, has announced that the race on that track next Memorial Day will be for 300 instead of 500 miles, as the longer race has been found to be tiring to the spectators. It is said that a plan is under consideration to cut the prizes from \$50,000 to \$30,000.

HIGH-GRADE CARS STAY SOLD.

Alexander Winton, president of the Winton Company, Cleveland, declares that the reason high-grade cars "stay sold" is that the buyers know what they want and are satisfied when they get it. As fundamental philosophy, he adds that the desire for change is not strong where a person enjoys satisfaction. If a man is satisfied with his home, his recreations, his family, his mode of life, you do not find him craving a radical change. The prudent man knows very well that the new thing may be only an illusion and that afterwards he may wish he hadn't changed so radically.

This philosophy applies particularly well to the purchase of automobiles. While the dissatisfied clamor for strange and experimental offerings, the maker of high-grade cars continues to weave new merits into his already meritorious machine, and from season to season it gives buyers a delightful new zest that is unaccompanied by any risk of disappointment. Thus the makers of successful sixes are continuing to make them because they believe they have an excellence today that is years ahead of every other type. If this were not so, those makers would join in the scramble to cater to that desire for change which always attends dissatisfaction.

STUDEBAKER ESSAY CONTEST.

The Studebaker Corporation recently held a prize essay contest open to boys not over 17 years of age for the best discussion in 500 words of the full-floating rear axle used in Studebaker motor cars. Prizes totalled \$100. Forest E. Downey, aged 15, Philadelphia, won the first prize of \$50. The essays showed that young America has a very good idea of automobile construction and that many of the boys have a surprising amount of mechanical knowledge.

HYATT MILEAGE CONTEST.

Interesting and valuable data are being gathered by the Hyatt Roller Bearing Company through its mileage record contest. The "histories" are reaching the company's offices in large numbers and contain numerous startling records of the stamina of automobiles, especially their bearings.

One record relates of a car accredited with a remarkable mileage that is carrying United States mail over a 75-mile route in the West, one of

the wildest trips in any section of the country that was formerly covered by pony express riders who wore out a wiry mustang or two every year. The car has suffered breakdowns occasionally, according to the report, but they have never been caused by the Hyatt bearings, with which it is equipped.

SCRIPPS-BOOTH WILL NOT CUT PRICE.

The Scripps-Booth Company has announced that its price policy will be one of upholding the quality of its product first of all, and that it will not indulge in radical price reductions of new models to stimulate sales. The company declares that it wishes to avoid the rapid depreciation of cars already sold which this brings about and that it cannot build up to its standard of quality by rushing through a new design for announcement.

PROVIDENCE AUTO SHOW.

In naming Friday evening as the opening date of this year's Providence automobile show, which is to be held in the State Armory, Nov. 12-20, Percival S. Clark, secretary and general manager, states that he has developed a decided innovation in the practise of holding automobile shows. The first night is known among exhibitors as "paper night," when those holding gratuitous passes attend in large numbers, and it is expected that two whole Saturdays can thus be obtained for business men.

Tourists can obtain valuable information by calling at the secretary's office at 57 Eddy street. Here also is kept full data relating to credits, trade schedules, unfair lists, employment, legislation, transportation and general information.

CLOSED CARS SELL AT CINCINNATI.

The sixth annual motor car show opened in Cincinnati, Oct. 2, with 50 exhibitors showing their wares and 400 cars on the floor. The territory served by the exhibitors includes parts of Ohio, West Virginia, Indiana, Kentucky, Virginia and Tennessee. Invitations were sent out to 1300 small town dealers to attend the show and it seemed that all of them were present. The show proved a positive stimulus to business and closed cars of detachable body types sold with especial readiness.

EXPORT SALES DOUBLED LAST YEAR.

THE Department of Commerce has given out figures regarding the exports of automobiles and parts during the past year and they indicate a doubling of that business as compared to a year ago. The total for the year ending June 30 aggregated \$74,000,000, as compared to \$38,000,000 for 1914, \$2,000,000 in 1904 and \$1,000,000 in 1902. The gains were most pronounced the second half of the fiscal year. If the gains shown in July continue the business will reach \$100,000,000 for the calendar year of 1915.

All countries of the world are among the buyers, 80 different nations having received shipments. Motor trucks are being sold most largely to England, France and Russia. In Greece, Denmark, Sweden and Servia sales have also reached unparalleled proportions. Increased sales are also being made in many countries far removed from the war zone, including Canada, Cuba, Central America, Java, Australia, British South Africa, and in Hawaii, Porto Rico and Alaska.

The year's exports of passenger automobiles are slightly less than those of the preceding year. Large gains have been made to the United Kingdom, Asiatic Russia, Cuba, Central America, the British West Indies, British Guiana, Venezuela and British East Africa. They were more than offset, however, by decreases in sales to France, Germany and various countries in Europe, South America and Asia.

The factors in the trade are shown in the following table:

	Value of Automobiles	
	1914	1915
Commercial	\$1,181,611	\$39,140,682
Passenger	25,392,963	21,113,953
Tires	3,505,267	4,963,270
Engines	1,391,893	1,405,334
Parts	6,624,232	7,853,183
Total exports to foreign countries	\$38,095,966	\$74,476,422
Total to Alaska	68,435	91,381
Total to Hawaii	1,285,258	1,514,585
Total to Porto Rico	686,906	775,879

NEW AGRICULTURAL TRACTOR.

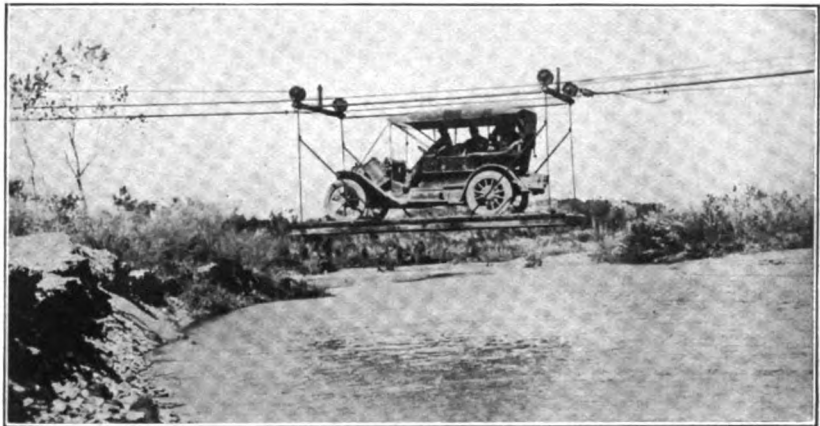
The Union Tool Company, Torrence, Cal., after several years of experimenting, has placed

on the market a three-wheel farm tractor which will sell for \$945. It has a two-cylinder motor and is 13 feet long and 6½ wide.

A DESERT STAGE LINE.

Between Silver City and Mogollon, the Bennett Motor Transit Company runs a motor stage over a route 90 miles long. The car is a 1910 Marmon, model 32, and for two years it has made regular trips between the towns.

There is no bridge over the Gila river which the car must cross. The water is too deep to ford, so a wire rope tramway has been built by which the car is loaded on a platform and pulled across. Last winter high water washed away



Marmon "Jitney" Crossing the Gila River by Overhead Tramway.

the tramway and 10 horses were hitched to the Marmon, which was pulled across the river with water so high that only one-half of the steering wheel remained above it.

WANT STRIKING SAFETY POSTER.

At the convention of the Safety First Federation of America in Detroit, Oct. 19-20, the Safety First Society of Greater Detroit announced a contest open to all artists in America for a poster to be used in all parts of the country. The first prize will be \$300 and there will be prizes of \$100, \$50, \$30 and \$20. Designs must be submitted to the society at the Detroit board of commerce before Jan. 1.

The convention of the national federation decided to urge the adoption of various safety

measures in all parts of the United States. Among these are mental, moral and physical examinations of chauffeurs.

FORD ANNOUNCES NEW DISCOVERY.

The Ford Motor Company announces the discovery of a new process in metallurgy that will save it \$3,500,000 on the iron and steel used in its cars. The process is also capable of producing enormous savings in the steel and iron business generally. On Henry Ford's return from the Pacific coast soon this process will be given to the public to be used by any one without payment of royalty.

By this process iron goes into the furnaces in the form of ore and is completely refined by one heat. It is not allowed to cool until it has been turned out in milled parts. For experiments for this purpose an iron plant with its entire force of employees was turned over to the company. Work by the new process was done and the results carefully tested.

According to Charles A. Brownell of the Ford company, who made the announcement, the new process not only resulted in very large savings, but the gray and malleable iron produced was much superior in quality to the ordinary variety.

The Ford company uses 700 tons of these metals every day and enormous savings will be secured.

SHEEPSHEAD INVITATION RACE.

A purse of \$20,000 and a gold trophy offered by Harry S. Harkness, president of the Sheepshead bay speedway, will be the prizes for which six and possibly eight of the year's speedway winners will contest in a special invitation race at Sheepshead bay, Nov. 2.

Six winners of the year's big races have already signed for the race. They are Dario Resta, Ralph de Palma, Barney Oldfield, Bob Burman, Eddie Pullen and Ralph Mulford. Eddie Rickembacher and Earl Cooper may be added.

Four of the cars will be Peugeots and will be driven by Resta, Burman, Pullen and Mulford. De Palma will be at the wheel of his Mercedes, which he now has at the Packard factory in Detroit, where it is being prepared for the race. Oldfield will drive his Delage and Rickembacher a Maxwell.

Stutz will not be represented in the race owing to the fact that the cars have been withdrawn from racing for the time being. If Cooper com-

petes it will be necessary to find him a mount of some other make.

Although the Sheepshead track has the American record for nearly all distances up to 350, the fastest time for 50 and 100 miles respectively has been made on the Brooklands track in England. The 50-mile record is 28 minutes 18.65 seconds, and for 100 miles, 56 minutes 29.93 seconds, or at a rate of 106 miles an hour. To insure, if possible, the breaking of both these records a \$500 prize will be given to the driver leading at 50 miles.

MOTORS IN MASSACHUSETTS.

Motor vehicles now comprise 83 per cent. of the traffic over Massachusetts roads according to a census that was made recently by the state highway commission in several parts of the state, covering roads and traffic of all sorts and under a variety of conditions.

Light horse drawn vehicles, which have been very generally replaced by motors, were found to constitute only seven per cent. of the traffic, and heavy horse drawn vehicles were 10 per cent. The count was made at 192 different stations throughout the state.

The total count was divided as follows: Light vehicles drawn by single horses, 7595; heavy, 8618; light vehicles drawn by two horses, 546; heavy, 4178. Of the various kinds of automobiles there were 15,478 runabouts, 76,053 touring cars and wagons, and 7670 under the head of trucks and omnibuses, a total of 120,112.

The percentage of different types of vehicles differed radically with localities. The chief automobile roads showed a high percentage of motor traffic, while some of the market district routes showed a much larger than average number of horse vehicles. At Lenox, on the Pittsfield road, for an instance, the proportion was 94 per cent. motors and six per cent. horses. Nearby, on the Lenox-Stockbridge road, used by regular business traffic, the percentage was 79 per cent. motors and 21 per cent. horses.

B. C. Day of the Packard Motor Car Company of New York has been chosen manager of the Buffalo branch. T. P. Myers has been made head of the truck sales department.

G. M. McGeorge, vice president of the Ford Motor Company, is reputed to have declared that Henry Ford owns but 25 per cent. of the stock of that company.

GENERAL NEWS OF THE INDUSTRY.

Ford Company's Annual Statement—Maxwell Discloses Dividend Plan—Packard Surplus Increased \$2,000,000—Personal News.

INCLUDING only 10 calendar months in its 1915 fiscal year, the Ford Motor Company showed in its annual report a surplus of \$59,135,770. This is an increase of \$10,308,738 over the surplus at the end of the fiscal year of 1914. Compared with 1913 it is an advance of \$31,011,507, and with 1912 an increase of \$44,390,675.

The cash on hand account shows an advance of \$16,346,682 over that for 1914. This account in 1913 had \$13,225,710, and in 1912 \$6,400,100.

The statement for 1915 represents the business for only 10 months, because last year it was decided to change the closing date of the fiscal year from Sept. 30 to July 31. The statement follows:

Assets.		1915
Cash on hand and in banks.....		\$43,788,151.23
Michigan municipal bonds at cost.....		1,311,924.10
Accounts receivable		2,300,466.42
Merchandise inventory at cost		14,335,767.87
Outside investments		9,200.00
Prepaid expenses		385,377.56
Real estate		3,148,263.01
Buildings and building fixtures.....		12,931,884.45
Factory equipment		2,606,356.06
Furniture and fixtures		328,497.30
Power plant and machinery		5,693,648.50
Tools		1,491,824.85
Patterns		142,998.22
Patents		61,472.84
Machinery, tools and equipment at branches		
Total.....		\$88,535,840.41
Liabilities.		
Accounts payable, not due		\$4,947,805.81
Accrued pay rolls		428,907.14
Accrued salaries		341,814.16
Accrued expenses		463,111.47
Contract rebates		1,281,661.01
Contract deposits		1,968,844.89
Reserve for funds to take care of reduction in price		
Reserve for employees' bonus.....		
Reserve for bad debts		
Reserve for depreciation of fixed assets....		2,885,188.94
Reserve for depreciation of patents.....		61,472.84
Fire insurance reserve		51,263.49
Reserve for profit sharing		15,000,000.00
Unearned profits—branches.....		
Capital stock		2,000,000.00
Surplus		59,135,770.66
Total.....		\$88,535,840.41

BUSINESS INCREASED 218 PER CENT.

At the termination of the fiscal year, Oct. 1, the Chase Motor Truck Company, Syracuse, N. Y., showed in its annual report that its business

had increased 218 per cent. over that of the preceding fiscal year. It is generally understood that the company has not shipped a single one of its water cooled worm driven trucks, in which the Chase company specializes, to any of the belligerent nations, and that the business is all domestic and due to the highly efficient sales organization.

STUDEBAKER EARNINGS.

The estimates of earnings of the Studebaker Corporation have been advanced in amount since the issuance of the annual report of the General Motors Company. The latter was expected to earn between 50 and 60 per cent. on its common stock and showed earnings of 80 per cent. Studebaker has been expected to show about 25 per cent. earnings compared with 14 per cent. of last year, but basing their estimates upon General Motors' experience, the financial sharps are now predicting 35 per cent.

MAXWELL'S DIVIDEND PLAN.

The directors of the Maxwell Motor Company, Detroit, have issued a circular to stockholders in which it said that they have decided, subject to the approval of stockholders as to the necessary increase in the capital stock, to declare on Dec. 14 a dividend of 14¼ per cent. on the first preferred stock. The directors declared that it would not be wise at this time to pay the accumulated dividends on the first preferred in cash, which would take \$1,749,804 out of the treasury. Therefore, they decided to permit the holders of that class of stock to take at their option in payment of the dividend after Jan. 3 up to June 30, first preferred stock at par, scrip certificates to be issued for fractions of shares.

The total net income of the company up to June 30, 1915, was \$3,808,781. The amount disbursed for dividends was \$613,483, leaving a balance of \$3,195,297. The circular states that the volume of business for the three months from July 1 was more than double that for the corresponding period of the preceding year.

The amount of new first preferred stock required for the dividend of \$1,749,804 is \$1,029,136.

It is not contemplated that any part of the new first preferred stock will be issued except to the extent necessary for the conversion of dividend warrants and for any subscriptions from the other classes of stockholders that may be received.

A special meeting to vote on the plan has been called for Dec. 11 at Wilmington, Del.

CHALMERS STOCK LISTED.

Stock of the Chalmers Motor Company has been admitted to trading in the outside securities market.

The common stock has paid \$10 per share for several years, and shareholders have received many additional benefits in the way of cash and stock dividends. In August, 1910, a stock dividend of 900 per cent. was declared. On Oct. 1, 1912, a stock dividend of 13 1/3 per cent., and in June, 1913, another dividend of 25 per cent. in stock were paid to shareholders. It is expected that the company will earn at least 30 per cent. for the common stock this year.

After making allowances for paying off liabilities and the \$1,186,500 preferred stock at par, the assets of the company, without taking into consideration the item of good will, would equal over \$120 per share on the \$5,000,000 common stock.

DECLARES 100 PER CENT DIVIDEND.

The Continental Motor Manufacturing Company, Detroit, has declared at a stockholders' meeting a stock dividend of 100 per cent., and has decided to increase the capital stock from \$500,000 to \$2,900,000. For the fiscal year ending June 30, the surplus account showed over \$1,200,000, a half million more than for 1914.

NEW AUTOMOBILE COMPANY.

The Biddle Motor Car Company, Philadelphia, a newly formed company, is preparing to place on the market four new automobile models, two of which are ready. The line comprises an \$1800 touring car, a \$1700 roadster and a \$3000 town car. The fourth will be a town car, equipped with a Duesenberg motor. The present chassis have a three-point suspended Buda unit power plant, with four cylinders, 3 3/4 by 5 1/8. Westinghouse ignition, lighting and starting systems

are employed. Wheelbase is 120 inches and tires are 32 by four.

DISCO INCREASES CAPITAL.

The business done by the Disco Electric Starter Company has made it necessary to increase the capital from \$60,000 to \$100,000. The new issue is taken up by the present stockholders. More increases are in view for the purpose of enlarging the factory and output. At present the company is doing \$1,000,000 worth of business a year and running night and day.

A new type of two-unit starter has been designed and is soon to be placed on the market. It is said to be low enough in price for the inexpensive car and powerful enough for the largest types. It was electrically designed by Benjamin G. Bailey, professor in the University of Michigan, and mechanically, by F. M. Guy.

PACKARD SURPLUS LARGER.

Greatly increased manufacturing facilities at the Packard Motor Car Company, Detroit, are shown in the annual report of Henry B. Joy, president of the company, just submitted to the stockholders.

While the revenues from all sources for the year ended Aug. 31 showed a total of \$16,325,722, the total disbursements were \$16,499,075, including heavy expenditures on the plant itself.

Cash on hand Aug. 31 amounted to \$2,289,111, as against \$2,462,464 of last year. The surplus was \$3,713,747, a net increase of \$1,915,926 for the year.

GENERAL MOTORS TO BUY.

Negotiations for the sale of the Warner Manufacturing Company's plant at Toledo to the General Motors Company are under way, according to a recent local announcement. Run in connection with the Willys-Overland Company, the Warner company makes gears and other automobile parts and employs about 1000 men.

U. S. RUBBER DIVIDENDS.

The United States Rubber Company, New York City, has declared a quarterly dividend of two per cent. on its first preferred stock, and 1 1/2 per cent. on the second preferred, payable Oct. 30 to stockholders of record Oct. 15.

PERRIN GOES TO TIMKEN.

J. G. Perrin, for 19 years chief engineer and factory manager for the Lozier Motor Car Company, has joined the engineering department of the Timken-Detroit Axle Company as chief engineer. Mr. Perrin is a member of the standards committee of the Society of Automobile Engineers and is one of the best known engineers in the country. The former Timken engineering chief, H. W. Alden, remains as vice president of the company.



J. G. Perrin, Chief Engineer, Timken-Detroit Company.

G. O. Baldwin, formerly service manager for the Cadillac and the Studebaker companies,

joined the Timken axle company as its service manager. Another addition is F. H. Maisenville, who was assistant purchasing agent for the Packard company, and takes a like position under W. H. H. Hutton, Jr.

PAGE HEADS NEW DEPARTURE.

DeWitt Page was elected at a meeting of the board of directors of the New Departure Manufacturing Company, Bristol, Conn., to the presidency of the organization. He succeeds Albert F. Rockwell, founder of the concern, who retires from active management, but retains his interests in the company.

R-C-H LOSES TWO MEN.

A. H. Collins, vice president and assistant general manager of the R-C-H Corporation, Detroit, and V. S. Hibbard, advertising and sales manager, have resigned. Both men have been generally accredited with being largely instrumental in building up the present R-C-H organization. They leave Nov. 1 to take similar positions with a new firm.

KLINGENSMITH SUCCEEDS COUZENS.

The position vacated by James Couzens in the Ford Motor Company has been taken by Frank L. Klingensmith, former secretary of the company. Henry Ford's son, Edsel B., will assume

the duties of secretary. The new general manager started with the Ford company several years ago as a clerk at \$12 a week.

CHANGES IN REPUBLIC RUBBER.

Recent changes in the organization of the Republic Rubber Company place L. T. Peterson, first vice president, in charge of all factory operations; A. H. Harris in the position of manager of works, and W. D. Morris in charge of all tire departments.

H. R. HARRISON RESIGNS.

H. R. Harrison has resigned as advertising manager of the Chalmers Motor Company, and has been succeeded by Gail Murphy, formerly with the Art Metal Construction Company.

COUNSELMAN RE-ENTERS TRADE.

Lee Counselman, for the past seven years vice president and general manager of the Chalmers Motor Company, has become allied with J. T. H. Mitchell, Inc., sales and advertising counsellors of New York City and Chicago. Mr. Counselman has been associated with Hugh Chalmers for 15 years, the first eight of which he acted as assistant to Mr. Chalmers in the department of selling and advertising at the National Cash Register Company. He comes from a year of business inactivity and will be located at 8 West Fortieth street, New York City.

HUFF GOES TO DODGE.

Russell Huff, one of the best known engineers of the country and consulting engineer for the Packard Motor Car Company, will become the chief engineer of Dodge Brothers on Nov. 1. He has been identified with the Packard product almost from the first car made, and was the chief lieutenant on the engineering end of S. J. W. Packard. Mr. Huff is expected to take the president's chair in the Society of Automobile Engineers at the next election.



Russell Huff, Chief Engineer, Dodge Brothers.

CONTRACTOR'S SPECIAL TRUCK BODY.

THE large manufacturers of motor trucks are adapting their vehicles to meet the demands of those whose work require special equipment, instead of making it necessary for the purchaser to equip them after buying. In many instances a prospective owner can obtain practically all he requires without additional cost.

One of the most recent examples of this practice is what is known as a "general utility" machine that is built by the International Motor Company. It is the five-ton Mack truck shown in the accompanying illustration.

The chassis is standard throughout, but to ob-

ger heads" can be operated with the full power of the engine.

The upper section of the frame carries the mechanism by which the front end of the body can be elevated to any desired height. An angle of 50 degrees is entirely practical for the discharge of a load of wet or bituminous material.

PITTSBURG TO MAKE AUTOS.

Elmore E. Gregg, a Pittsburg automobile man, known throughout the country, has formed a new company, which is to produce a motor car

in a Pittsburg plant. Options have been secured on two factories having capacity for an output of about 10,000 cars. The car is said to have been designed by a very well known engineer and the price will be low enough to be in reach of a very large market.

While 45 per cent. of the raw material that enters into motor cars has been produced in Pittsburg, the city has not been prominent up to this time as a producer of completed cars.

Andrew Carnegie recently expressed the opinion that Pittsburg was the natural place to build a car, as the chief materials can be se-

cured there at a lower cost and quicker than anywhere else in this country.

SMITH A CHALMERS OFFICIAL.

Paul Smith, in charge of the sales, service and advertising departments of the Chalmers Motor Company, Detroit, has been elected to a vice presidency of the company, to fill the position vacated by Lee Lowell. Mr. Smith joined the Chalmers organization about six months ago. He was sales manager of the old E. M. F. Company.

The United Daughters of the Confederacy are proposing a transcontinental highway to extend across the southern tier of states as a memorial to Jeff Davis.



Mack Truck Equipped with End Discharge Dumping Body, Hoisting Drum and "Nigger-Heads" for Winding Chain or Cable, Intended for Contractors' Use.

tain the fullest use of its power it is equipped with a heavy hoist frame directly behind the driver's seat. In the lower section of this frame is installed a large winding drum on which a wire cable can be wound. It is particularly adapted for hoisting heavy weights. At either end of the shaft of the drum are "nigger heads," on which cable or chain can be wound by holding the free end.

This allows hoisting to be done from either side, a convenience that is a decided saving of time and labor. By use of the drum heavy freight can be drawn into the body, or hoisted by block tackle into buildings. With the "nigger heads" and a cable the truck can be extricated from soft ground by its own power or drawn up very steep ascents with a full load. The drum and the "nig-

MOTOR STARTING AND CAR LIGHTING.

Characteristics and Qualities of the Remy Systems—The "Double-Deck" Combination Motor and Generator, the Single and the Two-Unit Types.

STARTING, lighting and ignition devices of practically every type are manufactured by the Remy Electric Company, Anderson, Ind., and these may be classified as single-unit, two-unit and three-unit systems. The single-unit includes a motor-generator with a distributor incorporated in the assembly, the two-unit systems include generators and distributors in one assembly and separate starting motors, the three-unit system, which is not generally utilized because of the greater simplicity and satisfaction obtaining from either of the other two, includes a motor, generator and a magneto. The necessity for the battery with the starting and lighting is a sufficient reason for combining a distributor with the generator.

The company produces a great diversity of electrical apparatus designed for ignition, lighting and engine starting, a considerable part of which was developed for special purposes. In the systems what has been proven by experience to be best suited for the service required has been combined in the units, and these have been perfected to insure endurance and satisfaction in constant use in all operating conditions.

The model SL Remy single-unit lighting and starting system consists of a combination machine that, while it has all the qualities desired in one assembly, is in reality two separate instruments, although contained in a single case or housing. This is a type that is known among electricians as a "double deck" machine—that is, it has two separate fields and two separate armatures, the motor being superimposed over the generator.

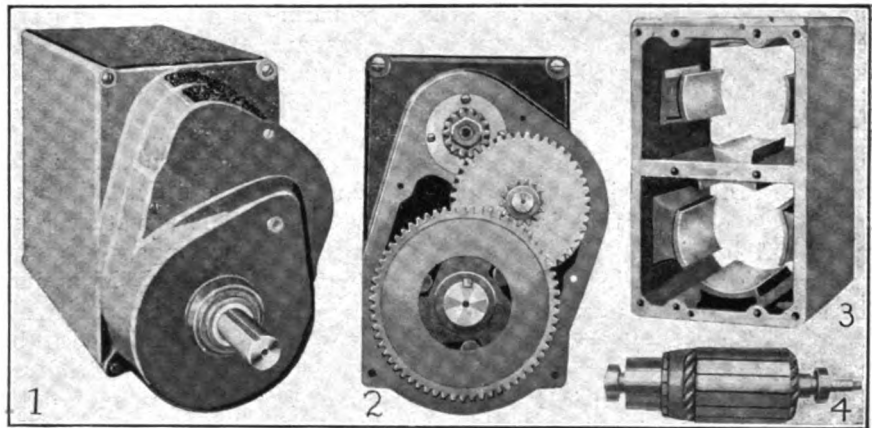
Numerous advantages are claimed for this construction, one of which is compactness, the machine requiring no more base area than either a motor or a generator of similar capacity, and but little more, if any, height. While each part

of the unit is independent, it is so designed that it is driven by a train of gears that affords the necessary reduction, and connection may be made with the crankshaft of an engine by gears or a silent chain as may be best suited to the construction of the engine or chassis.

But one driving shaft is necessary. The machine can be driven in but one direction, but it may be driven from crankshaft speed to twice crankshaft speed, the drive ratio depending upon the size of the engine, the conditions and the lamp load to be carried.

The Generator Characteristics.

The frame or housing is a rectangular steel casting that is divided in the centre by a cast



The Model SL Combined Starting and Lighting One-Unit, Six-Volt System: 1, the Machine Completely Assembled; 2, the Gear Housing Removed, Showing the Gears and Over-Running Clutch; 3, the Double-Deck Frame; 4, the Motor Armature and Its Ball Bearings.

web, and the ends are enclosed by cover plates that carry the bearings for the armature shafts. Both the motor and the generator are specially designed to have endurance and capacity. The poles are integral with the casting and are carefully machined. The generator is a bipolar type shunt wound, having inherent regulation, affording high current production at low speeds and diminished output at increased speeds. This generator will carry a full lamp load at slow vehicle speed, producing approximately seven amperes from 8½ to 10 miles an hour, according to the size of the wheels and the gear ratio. This means

that at the speed stated there is no drain upon the battery.

The armature is a slotted drum type, the slots or channels for the windings being spiralled to reduce noise and insure a smooth running machine. The copper windings are double covered with cotton fabric and thoroughly impregnated with insulating compound. The armature is mounted on a steel shaft that is carried on large annular ball bearings. The commutator is carefully made from a high quality of copper and it is insulated with mica. The brushes are a special copper carbon of low resistance and high conductivity. The pole windings are unusually well insulated and protected.

The Design of the Motor.

The motor is a four-pole series wound type that is designed to have a maximum capacity of six volts, that will develop sufficient power to start any engine of reasonable size at a speed more than sufficient to obtain its own power production. The motor is designed to be extremely economical of current and to have unusual endurance. The armature is a standard construction, the slots or channels for the windings paralleling the shaft. The armature windings are very heavy, constructed to withstand a substantial overload, the coils being double-insulated and impregnated with insulating compound. The commutator is proportioned for the heavy work expected of the machine. The armature is mounted on a steel shaft that is carried on large annular ball bearings. Care is taken to have the field windings well insulated. The brushes are the same material as are used for the generator.

The Regulation and Control.

The commutator end of the unit is enclosed with a plate on which is a cover that may be taken off by removing two screws. This is to afford convenient access to the commutators for inspecting or cleaning them and the brushes. When the cover is in place the housing is water and dust proof. The bearings of the pinion ends of the motor and generator shafts are mounted in an end plate and outside of the motor shaft bearing is a pinion. A reduction gear, mounted on a stud, meshes with pinion. A pinion on this stud meshes with a large gear that is the outer member of an over-running clutch carried on the generator shaft. All the gears are steel and are case hardened, and are enclosed in an oil-tight housing. When driven normally the generator armature is the only moving part of the unit. An oil overflow is provided for the gear housing and an oil shield is fitted to the generator shaft to protect the armature from splash of the lubricant.

The regulation of the generator is by a third brush, which is connected with the field windings of the machine. With this unit a model 62 reverse current relay is used. This consists of an electro-magnet, a relay blade, points and a spring, that are mounted on a bakelite base. This disconnects the battery charging circuit when the voltage of the generator is lower than that of the battery, and at less than 225 revolutions a minute of the engine prevents the battery discharging through the generator. The generator windings are protected by a fuse that is placed in the field winding circuit, on the generator frame, which is enclosed in a bakelite case and can be readily renewed.

Combination Unit No. 129.

The Remy single-unit No. 129 is a combination motor-generator and igniter, in which the motor starts the engine, becomes a generator at a specific speed, and being combined with a magneto type igniter supplies current for firing the engine at all speeds. This unit is contained in a cylindrical cast steel housing having two heavy end plates in which the armature bearings are mounted. The armature is built to specifications that in general have been described for the generator of the model SL unit, it being constructed with spiral cut channels for the armature windings, with an extremely heavy commutator and very substantial insulation. The field windings are differential wound and thoroughly insulated. The armature is mounted on large annular ball bearings.

Maximum Capacity 12 Volts.

The capacity of the unit is 12 volts maximum. It is designed to be used for starting the engine, when it will operate as a compound motor until the engine has been started, and at a definite speed it becomes a shunt generator. At an engine speed of approximately 350 revolutions it will begin charging the battery, and the current will rise rapidly to a maximum of six volts, when it will remain constant, no matter what the speed of the engine. This unit may be driven through gearing or a silent chain from the timing gearset or the crankshaft as desired.

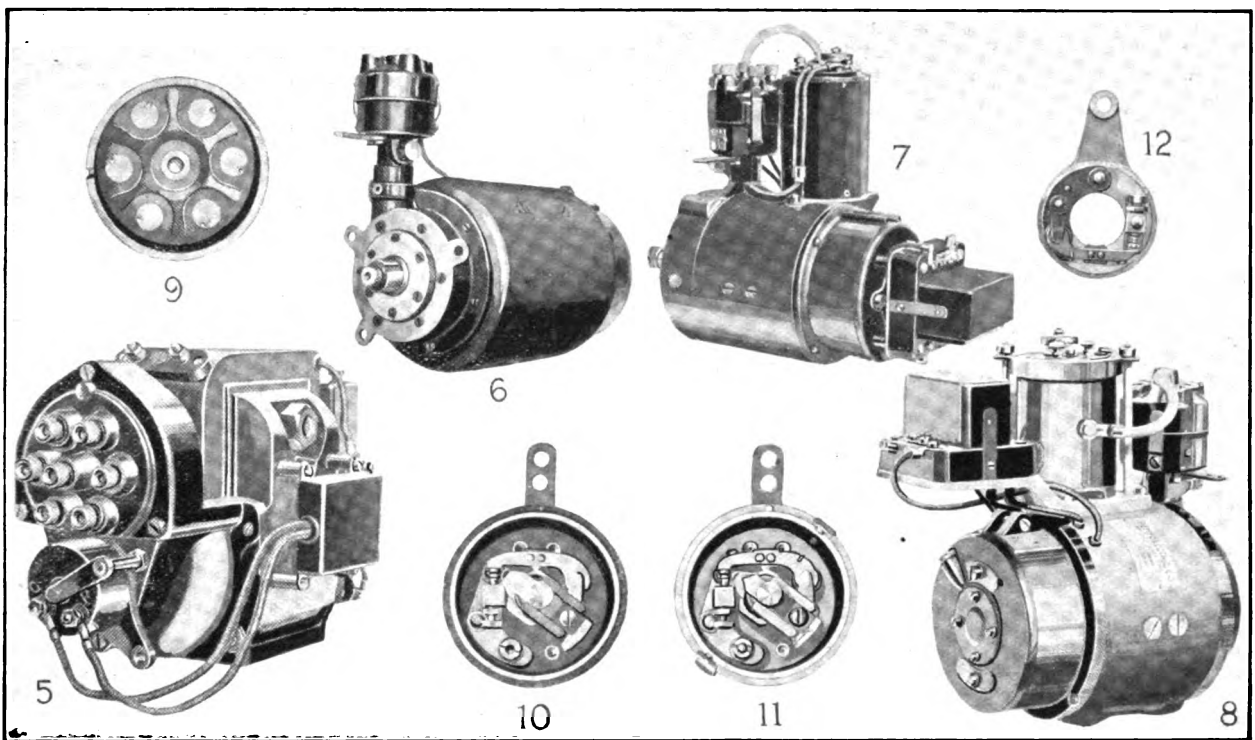
The regulation of the machine as a generator is by a regulator of the vibrating type that is entirely automatic in its action and requires no attention. The battery is prevented from discharging into the generator at slow engine speeds by a reverse current relay, which is also automatic in its service. The regulator and the relay are mounted on a block of bakelite and enclosed with a cover of the same material, which is both dust and water proof. In this block is also fitted a

protective fuse that will open the field circuit in the event the battery is disconnected while the engine is running.

The igniter that is driven by the armature shaft has the usual circuit breaker and distributor, the former to interrupt the current and the latter to send it to the different spark plugs in order. The distributor cap is bakelite and is water and dust proof. Advancing or retarding the distribution does not move or oscillate the distributor or its wiring connections. There is a safety spark gap in the bakelite distributor arm. This is used with a 12-volt ignition coil and suit-

One of these is known as model 165 ignition-generator, and this is enclosed in a frame that is carried on a base that better adapts it for installation. The ends are enclosed with heavy cover plates that carry the bearings. The field winding is mounted on the top of the case and is covered with a sheet metal cover. The purpose is to obtain a small, compact unit that will be especially enduring and have every quality of simplicity and accessibility.

This generator is a low-speed, shunt-wound, bipolar type, that is designed to be driven at crankshaft speed for four-cylinder engines and



Remy Motor-Generator-Igniter Systems: 5, Model 165 Ignition-Generator; 6, Model 129 Motor-Generator-Igniter; 7, Model 168 Ignition-Generator; 8, Ignition-Generator side the Housing; 9, Distributor Interior, Showing the erator-Igniter System, Removed, Showing the Circuit Breaker; 10, Circuit Breaker, with the Distributor Cap Removed; 12, Circuit Breaker of the Model 165 Igni-

tion-Generator; 11, Model 129 Motor-Generator-Igniter; with Coil, Distributor and Reverse Current Relay Out-Carbon Brushes; 10, Distributor Head of Model 168 Generator; 11, Circuit Breaker, with the Distributor Cap Removed.

able switches for the ignition and lighting systems.

The Remy Two-Unit Systems.

There are a number of combinations of Remy two-unit systems in which generator-igniters are used with motors. These may be installed to meet the best purposes of the vehicle engineer, the motors being coupled with the timing gear-set by gears or silent chain, or with the flywheel. The generator-igniter may be driven by an outside shaft or coupled by gears to chain to the timing gearset.

1½ times crankshaft speed for six-cylinder engines. The case is a steel casting that is cylindrical in form and to which the end plates that support the annular ball bearings are attached by bolts. The field windings, however, are outside instead of inside the case. These are form-wound and specially insulated to thoroughly protect them.

Slotted Drum Spiral-Cut Armature.

The armature is a slotted drum construction, with the channels spiral cut, and in these the windings, which are made of enamelled wire, cov-

ered with two thicknesses of cotton fabric, are placed. The insulation is very carefully made, the fabric being impregnated with a special compound. The commutator is the same general construction as those described. The armature is mounted on a solid shaft and is perfectly balanced. The brush holders have been so designed that the brushes are readily accessible, no matter what the location of the unit, and either the brush or the spring units may be taken out by removing one screw. The brushes are a copper-carbon compound. The installation is such that by removing the reverse current relay, which is held by two screws, the commutator is accessible.

The current production of the generator is regulated by the use of a third brush. The principle of this regulation is that at low speed the magnetic flux of a generator is evenly distributed along the faces of the pole pieces, but at high speeds this flux becomes distorted. The third brush, which supplies current to the generator field winding, is so located in relation to the main line brush of opposite polarity that this distortion of the magnetic flux reduces the current supplied to the field windings, and this decrease of the field current causes a decreased production by the generator and within the limitations desired. This affords what is known as inherent regulation and insures an efficiency of standard value without adjustment or attention. The reverse current relay is adjusted so that it will disconnect the battery from the generator when the speed of the generator is less than 225 revolutions a minute, during which period the voltage generated will be lower than that of the battery. On the relay base is a fuse that protects the field winding of the generator in the event of the battery becoming disconnected while the engine is running.

The Ignition System.

The ignition system includes a magneto type, high-tension distributor, a circuit breaker, a specially constructed coil and a switch. The distributor is built to obtain precise results. The armature gear is steel and the distributor gear of bronze, both specially cut to obtain evenness and quietness of operation. The insulation is with bakelite. The distributor has incorporated with it a timing button, by which the position of the circuit breaker, when timing the distributor to the motor, can be obtained with certainty. The circuit breaker is so constructed that it may be readily removed for examination without the use of tools.

The motor usually used with the generator

just described is known as model 181 when installed on six-cylinder cars and a model four starting motor is used with four-cylinder cars. The construction of the two is identical, but the former is slightly larger. These motors are a four-pole, series-wound type, designed for use with a current of six volts. They are completely enclosed in steel frames that are water and dust tight. In general constructional detail they are similar to those that have been described, the purpose being to obtain machines of large capacity and endurance with small current consumption. They are designed to carry heavy overloads without damage.

(To Be Continued.)

ENGLISH RAISE GASOLINE TAX.

In addition to imposing a tariff of 33 1/3 per cent. on imported motor cars and parts, not including those used strictly for commercial purposes, the new English budget raises the tax on gasoline by three pence—six cents—a gallon.

A tax of six cents on motor fuel used in passenger cars already existed, but it was cut to three cents on fuel used in commercial vehicles. The proceeds of this tax were formerly used for repair and maintenance of roads.

The new arrangement, therefore, makes the tax on gasoline used in passenger cars 12 cents a gallon and in trucks nine cents. The money raised will now go into the exchequer to pay the general expenses of the government instead of being used for roads. The road board has in fact been cut off from practically all funds during the period of the war and no road work will be done in Great Britain.

The budget also raised the tax on war profits of manufacturers making supplies for the army to 50 per cent.

British truck interests feel that they have been hard hit by the arrangement. On a large truck the new gasoline tax will increase operating expenses for a year by about \$250, which in many cases where the truck is operated by a trucking company will materially reduce profits, especially where contracts have already been made at a stipulated rate. It affects taxi cab companies in the same way, as their rates are determined by the government. Those trucks which are operated merely as the transportation division of some other business can meet the situation by making a greater charge for their product or other services.

The neglect of the roads is another factor making against truck service.

MOTOR 'BUSES IN HONOLULU.

THE reported dwindling of the number of jitneys in operation in this country is contrary to the experience in some of the United States island dependencies. The Rapid Transit Company of Honolulu, Hawaii, has placed in service a fleet of four machines, built by the Packard Motor Car Company, Detroit, and equipped with special bodies designed for tropical climatic conditions.

Honolulu has a population of about 60,000 and it has a system of street railways to meet the requirements of only the city itself. The rapidly growing suburban sections, which are increasing in importance, are not sufficiently populous as yet to justify extensions of the existing car lines. Consequently the street railroad company ordered the four Packard chassis to care for the traffic to the suburbs.

The chassis are the standard Packard two-ton truck type, which are standard in every respect, having worm and gear wheel power transmission systems, left side control and drive, and special starting and lighting systems, with Golden Glow headlights and a special type of windshield.

The bodies were designed and constructed by the Hopkins Manufacturing Company, Hanover, Penn., and New York City, a concern widely known for the excellence and diversity of work turned out. These have inside seating capacity for 23 adult persons, and there is room for an additional passenger on the driver's seat. The driver constitutes the entire crew.

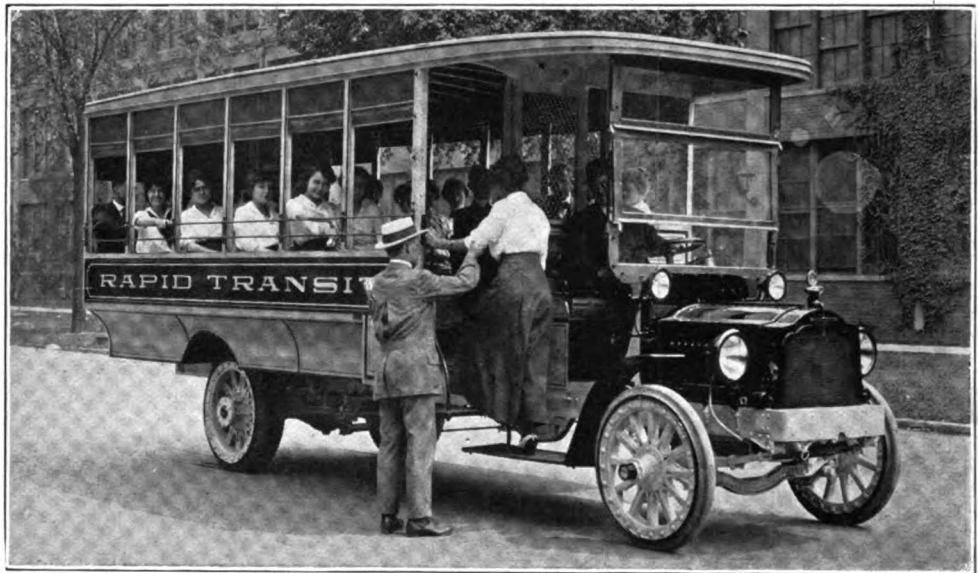
Entrance and exit is through a door at the forward corner of the right side, where the driver collects fares. The step is so located that it is always within his vision, which is an insurance against accidents from starting too soon.

There are nine regulation street car seats to

each 'bus. They are built of steel, brass and wicker work, and there is a special full width seat at the rear that will seat five persons. The body windows are always open, but are provided with heavy curtains on spring rollers, which offer sufficient protection against rain or the sun's rays. Three dome lights are located in the ceiling.

HAYNES AIDS CAR RECOVERY.

The value of co-operation between the car maker and the car owner and dealer was recently shown in the case of a Haynes Six, stolen from



Type of Packard Two-Ton Chassis, Fitted with Special Body, Built for the Rapid Transit Company, Honolulu, Hawaiian Islands.

a garage in Mason City, Ia. The owner, W. H. Hubbard, at once telegraphed the factory and a circular letter was sent out to all dealers, describing the car and asking them to watch for it. This was on Aug. 31.

On Oct. 7 a telegram was received from Ogden, Utah, saying that the car had appeared there and that the thieves had been jailed and the car recovered. Automobile makers throughout the country are rapidly developing and systematizing effort of this sort in the owner's interest.

AUTOMOBILES AND TAXABLE INCOMES.

Because 50,000 automobiles were purchased in Iowa last year, a Washington newspaper edi-

tor has come to the conclusion that there are a great many income tax dodgers in that state. While there are more taxable incomes in the District of Columbia than in Iowa, the latter has more automobiles and also more paupers, the paper states.

The register of Des Moines did not like the conclusion and set out to disprove it. From the state automobile department it learned that only from 10 to 12 per cent. of the cars in Iowa cost more than \$2000, and only 20 per cent. cost \$1500 and over, and that over 50 per cent. are Fords, costing from \$400 to \$500. All the cars together average in value from \$800 to \$900.

The editor then took an automobile census among its own employees and discovered that 16 men connected with the paper owned cars. Of

the story of Paige success in the newspapers and many of them used window displays, reinforcing the story. The display in Detroit was one of the best. The entire history of the Paige development was told in the window. There was the original three-cylinder, two-cycle Paige roadster, which sold for \$875 in 1909—a car that had been driven nearly 100,000 miles; a 1911-12-13 model 25, which sold for \$1100, and a 1914-15 25 four-cylinder, which sold for \$975, and finally the Paige Six-46, selling for \$1295.

BLOCK SYSTEM ON FIFTH AVENUE.

A try out on a large scale of the block signal traffic system has been started on Fifth avenue, in New York City. Third Deputy Police Commissioner Lawrence B. Dunham, who is in charge of the work, thinks at least a two weeks' trial will be necessary to determine the value of the system.

There is a semaphore at every crossing, as well as a policeman. The semaphores are operated in units of five, so that each vehicle on the avenue can run five blocks without interruption.

Two large banners are suspended across the avenue at the intersections and on these the traffic rules are printed. The only feature of the system that has so far caused difficulty is the left turn into the cross streets. A vehicle must either wait in the centre of Fifth avenue until traffic is allowed to flow east on the cross streets or it must turn right and circle the block through Sixth avenue.

The waiting in the centre of the streets takes up much room and leaves only two narrow aisles for traffic. Right turn is objected to by shop keepers on the side streets east of Fifth avenue because it would be necessary for people coming down Fifth avenue to their places to drive four blocks out of their way to reach them.

It is proving fairly easy to educate drivers to the new traffic system, but pedestrians are hard to handle and pay little attention to the signals. The semaphores are very useful in informing the driver a half block away as to the exact conditions at the crossing, which he could not know before because the policeman was frequently invisible. Whatever system is adopted the semaphores will be retained.

The Ford Motor Company of Canada declared a 600 per cent. stock dividend.



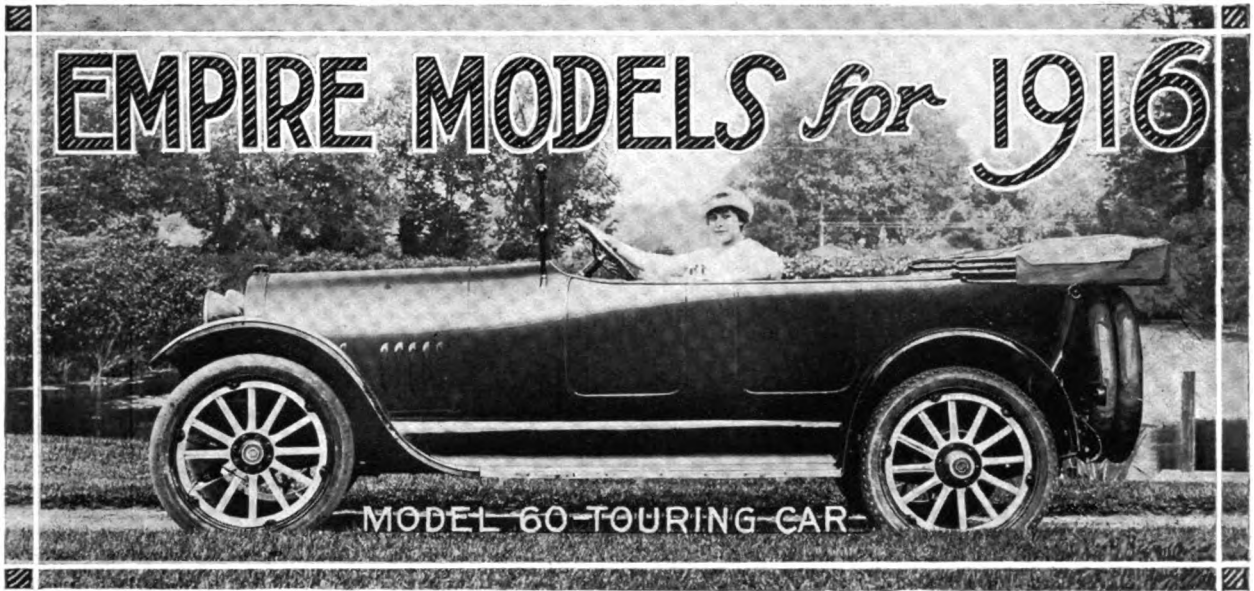
Interior of the Specially Built Bodies Used by the Rapid Transit Company of Honolulu, Designed for a Tropical Climate.

these 10 were men working in its mechanical departments—printers, pressmen and stereotypers—whose yearly incomes average under the union scale about \$1200.

Of the 10 cars owned in the mechanical departments eight were bought last year. Iowa bought 30,000 Fords last year and in the view of the register very few of those Ford owners are income tax dodgers. They are men who earn from \$1200 to \$3000 a year.

PAIGE JUBILEE WEEK CELEBRATED.

Paige jubilee week, which celebrates the end of the first year of Paige success in the six-cylinder field, was observed recently by nearly 1000 dealers all over the country. The dealers told



FOR six years the Empire Automobile Company of Indianapolis, Ind., built only four-cylinder cars, but it offers this year a six-cylinder machine which is large, roomy and very attractively designed, which is sold for \$1095. One four-cylinder car is built. It is called the 40 and the price is \$895.

Perhaps the most striking qualities of the new six-cylinder car are its roominess and the pleasing lines of the body. The wheelbase of 120 inches insures ample room for five passengers and the body is an attractive curved cowl convex side design. A noticeable feature is the arrangement of the seats, there being individual chairs for the driver and his companion. The rear seat is 49 inches wide, which is ample for three passengers.

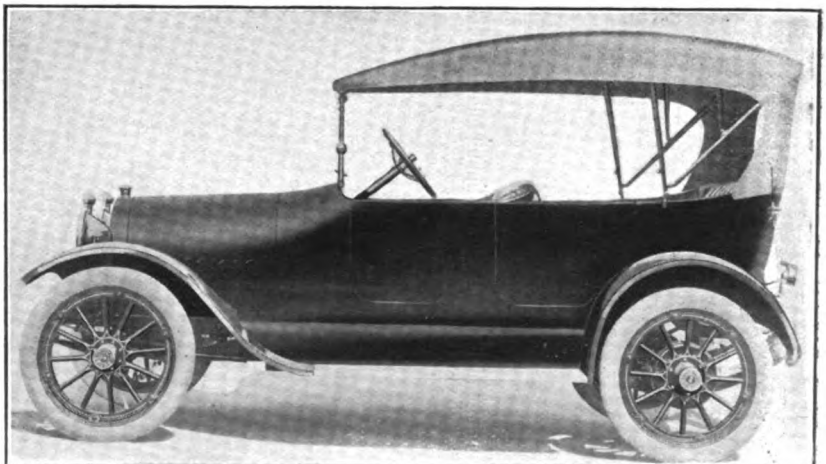
The six-cylinder motor is a high efficiency type, the cylinders being cast en bloc, having bore of three inches and a stroke of five inches. At 2200 revolutions a minute this motor develops 46 horsepower, while it is rated according to the S. A. E. formula at 21.6 horsepower.

The cylinders are an L head type and the valve have an overhead measurement of $1\frac{5}{8}$ inches, clear measurement $1\frac{3}{8}$ inches and a $\frac{5}{16}$ -inch lift. The crankshaft is a three-bearing type and the main bearings are split into upper and lower halves. All bearings are babbitt

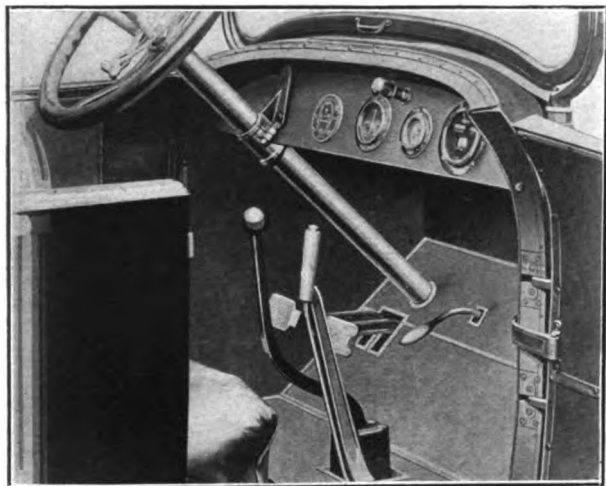
lined with a shell made of bronze metal.

Positive lubrication is afforded by a constant level splash system supplied by a plunger pump. The camshaft is submerged in an oil reservoir. The push rods never actually touch the cams, as there is always a film of oil between them. This insures greater silence in operation. The valves are at the right side. The cooling system consists of a Fedders cellular type radiator of extra large capacity and a centrifugal water pump.

All motor gears are helically cut. The carburetor is a specially designed Schebler installation of the horizontal type, the lead from the carburetor going direct into the cylinder intake. Current for ignition is generated by an Auto-lite generator mounted on the left side of the engine, and is stored in an oversize Willard storage battery. The engine is started by Auto-lite motor,



Empire Model 40, Four-Cylinder Touring Car.



Driving Compartment of Empire Model 60, Six-Cylinder Touring Car.

which connects with the flywheel through a Bendix drive or coupling. This is a new starting equipment for Empire cars.

The transmission gearset has three forward speed ratios and reverse. The main shaft is mounted on New Departure ball bearings. The universal joint in the propeller shaft is a Hartford heavy car type, which is oil tight and dust proof. The drive shaft is $1\frac{3}{8}$ inches in diameter.

Full Floating Rear Axle.

The rear axle is a Weston-Mott single-bearing, full floating design, with a large pressed steel housing and a removable 12-inch inspection cap at the rear. The wheels are keyed to the shafts on long tapers. Hyatt high duty bearings are used throughout the axle except behind the driving pinion, where a double row New Departure ball bearing is fitted.

The front axle is a drop forged single piece, I beam, which is dropped to afford a lower centre

of gravity. The steering gear is a full worm and wheel of the irreversible type. The drive is from the left side, with the control levers in the centre. The hand throttle and spark control levers are on a quadrant above the steering wheel. The wheel-base is 120 inches.

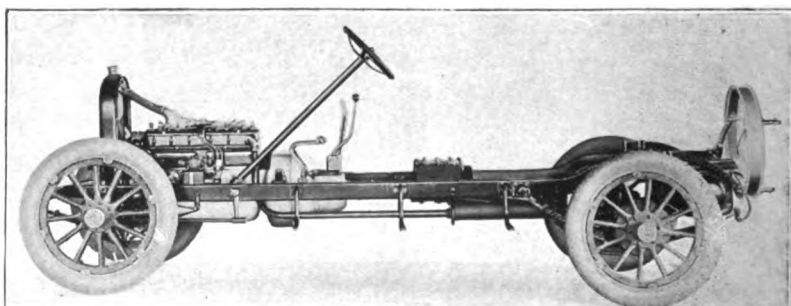
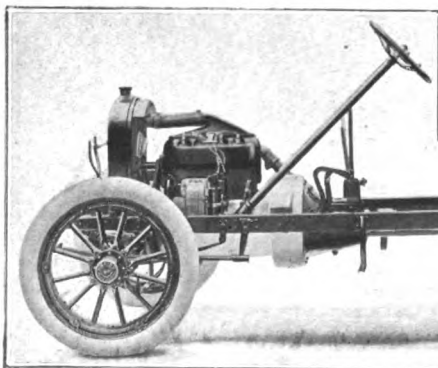
Fuel is drawn to the carburetor by the Stewart vacuum system and the gasoline tank is provided with a gauge. The wheels are a heavy artillery type, with 12 spokes front and rear. The front springs are semi-elliptic, 38 inches long, and the rear springs are three-quarter elliptic, 53 inches long. The rear springs are underslung on the axle housing. The tires are 34 by four-inch Goodyear or Firestone.

Two standard finishes are supplied, brewster green or royal blue for the body, with black running gear striped with white and vermillion wheels. The fenders are baked enamel finished.

Teetor Motor in Four.

The four-cylinder car has an Empire Teetor motor with T head cylinders cast en bloc, having bore of $3\frac{7}{8}$ inches and stroke of five inches, incorporated in a unit power plant. The crank case is a barrel type construction and affords a very rigid mounting for the three main bearings. The valves are very large, being two inches in the clear. They are interchangeable and have cast iron heads welded to nickel steel stems. The tappets are adjustable. The intake manifold passes through the cylinder block and is completely jacketed by hot water.

The Schebler carburetor is located at the right side. The camshafts have three large bearings. The cylinders, pistons and piston rings are of



Chassis of Empire Four and Six-Cylinder Models 40 and 60.

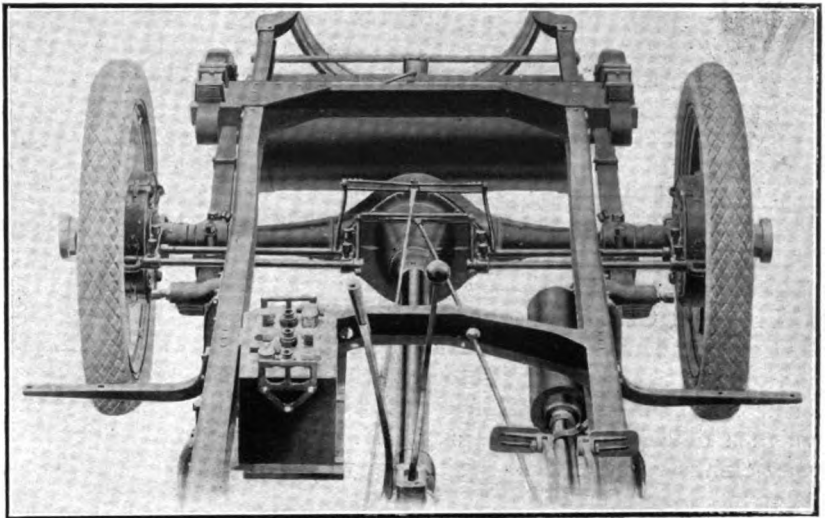
close grain gray iron and each piston is fitted with three rings. The connecting rods are drop forged from high carbon steel.

The engine is lubricated by a patented positive system, which consists of two overflow oil basins located in the lower part of the crank case.

In the bottom of the basins are drilled holes to admit a given quantity of oil. The lower ends of the connecting rods pass through this oil, keeping a certain amount in circulation and forcing the remainder into the oil reservoir. Cast integral with crank case is an oil pocket directly over each main bearing. These pockets are at all times full to overflowing and keep the cranksaft bearings perfectly lubricated. Timing gears are spirally cut.

A thermosyphon system of engine cooling includes a Fedders cellular type radiator. The distributor is a Connecticut construction and the ignition current is generated by an Auto-lite generator and accumulated in a Willard storage battery. The motor is started by an Auto-lite motor, coupled with the flywheel by a Bendix drive. The clutch is a cone with a chrome leather facing. Like that of the six-cylinder chassis, the transmission gearset is selective, having three forward speed ratios and reverse, with New Departure ball bearings on either end of the main shaft. The transmission shaft, rear axle, front axle, steering gear and control are similar to those already described in the six-cylinder chassis. The wheelbase is 112 inches. The gasoline feed is by gravity from a 14-gallon tank under the front seat.

Springs are similar to those of the six-cylinder car except that the rear three-quarter elliptics are shorter. The tires are similar in size, 34 by four-inch, which are exceptionally large for a car of the weight.



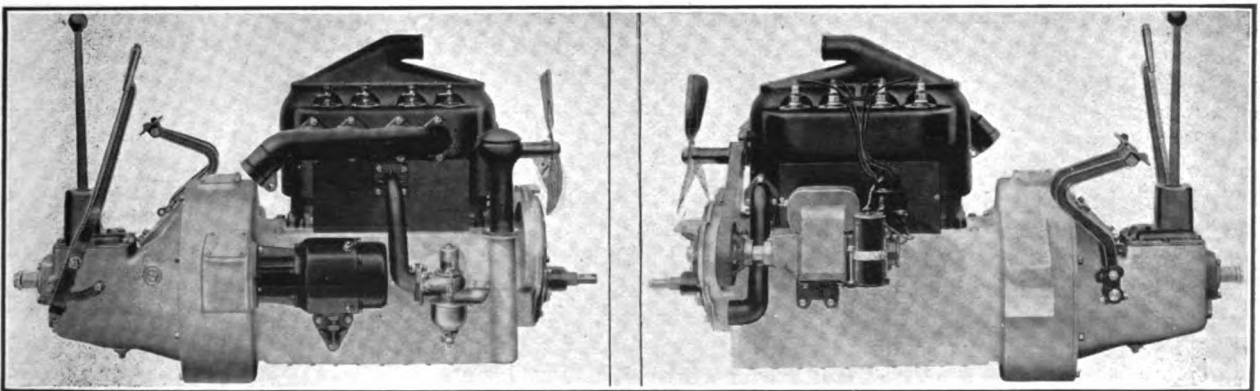
Rear of Empire Model 40 Chassis, Showing Frame Bracing, Spring Suspension and Partial View of Strapless Tire Holder.

The body material for both types is aluminoid steel. Both bodies are very attractive streamline designs with full U doors that have pockets inside. The wide, low seats, front and rear, have deep cushions and the upholstery is of selected leather. There is exceptionally large leg room both in the tonneau and the driving compartments.

APPERSON MAKES GAS RECORD.

On a recent pathfinding trip of 700 miles over all kinds of roads during which much mud was encountered, the new Apperson Eight averaged 13½ miles to a gallon of gasoline. The trip was made to log the route for the Kansas City motor car dealers' tour through Kansas and Missouri. It covered the distance in five days. Four passengers were carried.

Much of the territory through which the car



Unit Power Plant of Empire Model 40, Showing Location of Starter and Carburetor (Left) and of Generator, Coil and Distributor (Right).

passed had been under water for a month as a result of floods and in a few places it was necessary to build roads to get through. In one place the roads were declared to be impassable, but the car got through without going out of high gear except for a short distance. No water was added to the radiator supply.

WILL PROTECT "ALL YEAR" NAME.

President George A. Kissel of the Kissel Motor Car Company, declares that his company will go to law if necessary to protect its rights to the term "All Year" as a designation for a car with which a detachable body is supplied. His company claims to have used the term a year before other manufacturers.

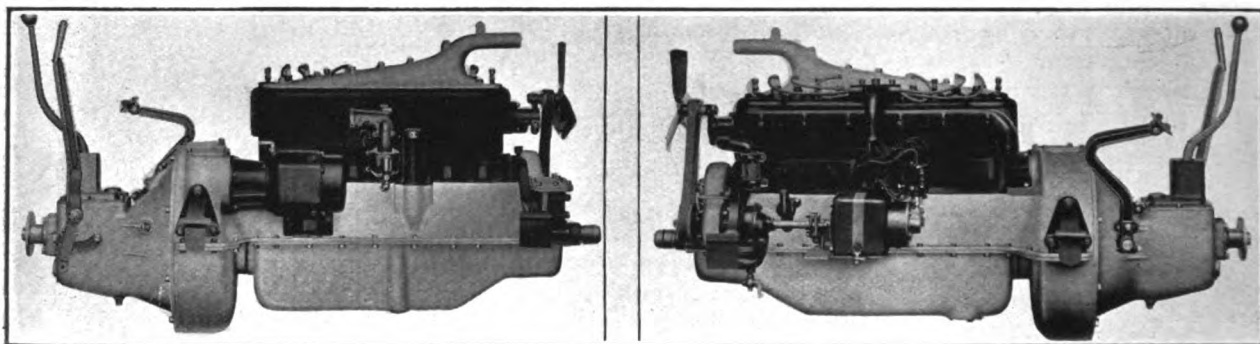
Many manufacturers have written the company, since their attention was called to Kissel's claim of prior rights in the name, assuring that

than 2,000,000 cars now in use and the thousands that are being added every day.

Thomas H. Daly, secretary of the company, acted as master of ceremonies at a dinner given at the Framingham Country club, at which cabaret performers from Boston furnished the entertainment. Salesmen connected with the company's branches in New York, Chicago, Boston and Philadelphia, as well as those who make the factory their headquarters, were in attendance.

OVERLAND IN R. A. C. ECONOMY TEST.

In an economy test over rolling country conducted by the Royal Automobile Club of England, an Overland model 83, which had just been unpacked from its crate and on which only a little more than three minutes had been spent in making adjustments, ran 75.5 miles on $3\frac{3}{4}$ gallons of gasoline. The run covered a combination



Unit Power Plant of Empire Model 60, Showing Starter and Carburetor Mounted, and the Water Pump, Generator and Distributor Installation.

the name would not be used. One important maker wrote: "We have no desire to adopt the trade expressions of competitors. We think the English language sufficiently elastic to suggest to the imaginative writer more than one way of conveying an impression."

MULTIBESTOS BUSINESS LARGE.

At a conference in Framingham, Mass., of the salesmen of the Standard Woven Fabric Company, maker of Multibestos, General Manager A. H. Burdick declared that the business for the current year would show a 100 per cent. increase over that of last year. Over 50 per cent. of the brake lining used by motor car manufacturers was said to be Multibestos.

The supply trade was shown by R. D. Northrop, advertising manager, to have grown enormously. A very interesting prophesy on the size of this market was made on the basis of the more

of up and down hill work and the result was an average of 20.13 miles per gallon.

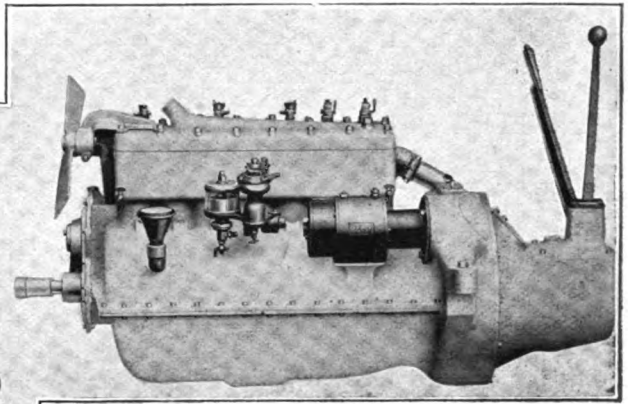
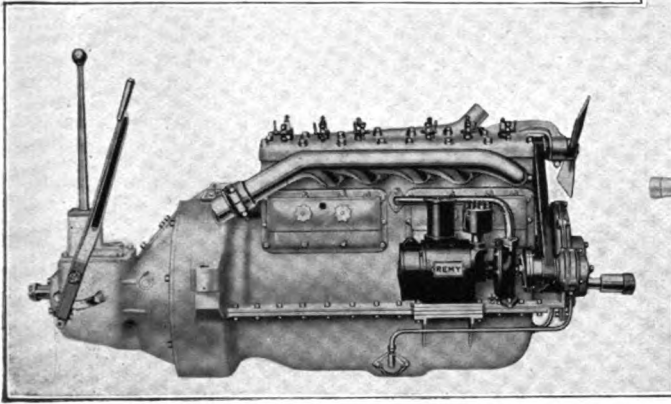
STRAIGHT PIPE UPHOLSTERY.

It is noticeable that although practically all motor car upholstery was formerly tufted in squares or diamonds, many of the recent cars are equipped with it in straight rolls. The Marmon company has been using this style for several months. Its advantage is said to be that it provides a neater finish, softer upholstering and a more secure binding for the hair.

AUTOMOBILES IN SPAIN.

There are 10,548 privately owned motor vehicles registered in all Spain, which has a population of 20,000,000. This is about one-half the number in Rhode Island, which has a population of about half a million.

THE MADISON SIX—



CHASSIS DETAIL

THREE attractive body types of neat streamline design are supplied by the Madison Motors Company for its Madison six-cylinder chassis. The roadsters and the five-passenger touring car are sold for \$985 and the seven-passenger car sells for \$1085.

A Reutenber motor of the L head type, with a three-inch bore and a five-inch stroke, is standard equipment. It has a three-bearing, six-throw crankshaft, which is carried in the upper half of the crank case. There are three rings on the pistons, the upper two of which serve as compression rings, while the third is an oil ring. The piston is relieved below the third ring and holes drilled in this relief so that the oil may more easily return to the oil basin through the hollow piston.

The connecting rods are a two-bolt cap type with die cast babbitt bearings on the crank pin ends and phosphorous bronze bearings of ample size in the piston pin ends. The piston pins are fastened securely in the pistons with hardened set screws that are locked positively with cotter pins. The load is thus carried on the connecting rod proper. A mushroom lifter type of camshaft is employed. It has three bearings—two are two inches diameter and the third is a Gurney annular ball bearing, which serves as a thrust and anchor ball bearing.

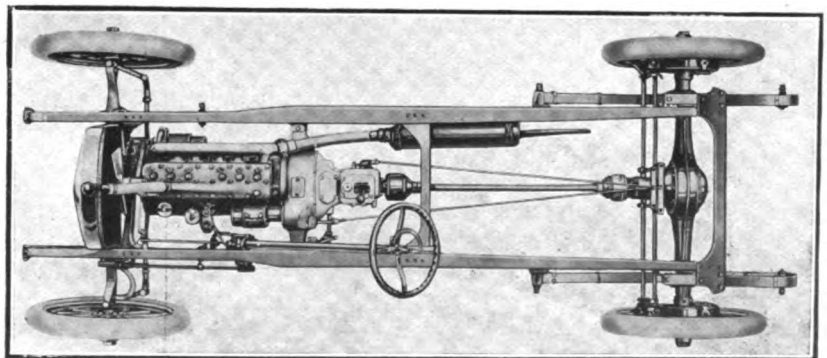
The valves are of tungsten steel and are $1 \frac{5}{16}$ inches diameter in the clear. The timing gears are helical and are cut at a 25-degree angle. This increases their serviceability and quietness.

The motor has a detachable head, which is held securely in place by 24 studs. Between the cylinder head and the cylinder casting is placed a copper asbestos gasket, which prevents water or gas leaks.

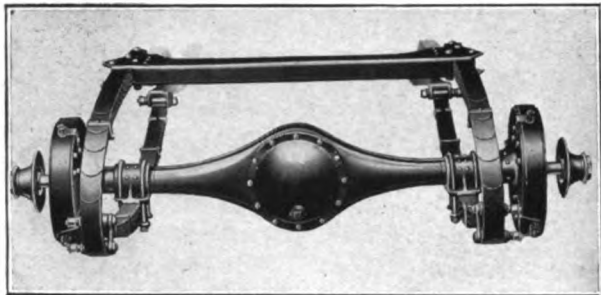
The circulation of oil is afforded by a vane circular pump, which draws the lubricant from the reservoir and brings it to the crank case oil pan. There is an oil lead from the pump to the timing gears so that a continuous stream is flowing on these gears at all times. The water circulation through the cooling system is by a positive driven pump of centrifugal type.

The transmission gearset is carried as a unit with the motor. It is made by the Detroit Gear and Machine Company and is a 20-30-horsepower standard transmission. The gears are all accurately cut and are made of $3 \frac{1}{2}$ per cent. nickel steel. New Departure annular bearings are used. The gear set is a selective type with three forward speed ratios and reverse.

The front and rear axles are made by the manufacturers of the transmission gear set. The rear axle is a full floating type and the load is



Details of Chassis Construction of the Madison Six-Cylinder Model.



The Full Floating Type of Rear Axle Used in the Madison Six.

carried on Gurney bearings. It has an ample overload capacity. Helical bevel pinion and gears are used to insure quiet operation. Nickel steel of $3\frac{1}{2}$ per cent. is used in the driving pinion. The axle has a gear ratio of 4.64 to one.

The driving effort is transmitted through the rear springs, which are two inches wide and 56 inches long. The drive shaft is fitted with Hartford universal joints. The forward joint is used as a slip joint to compensate variations between the joint centres due to road irregularities.

The tires are 34 by four-inch Goodyears. Non-skids are fitted on the rear wheels. An additional rim of the Stanweld demountable type is furnished as standard equipment and is carried on a combination tire carrier and tire support. Either one or two extra tires can be carried conveniently.

The upholstering material is unusually good. The body is finished in long grain bright finished leather and is padded with the best grade of hair.

The car is equipped with one-man top, ventilating windshield, Stewart-Warner speedometer, Rayfield carburetor

and Stewart-Warner vacuum gasoline feed. The Candler V-type radiator is used. This has an exceptionally large cooling surface and is said to be efficient in any operating conditions.

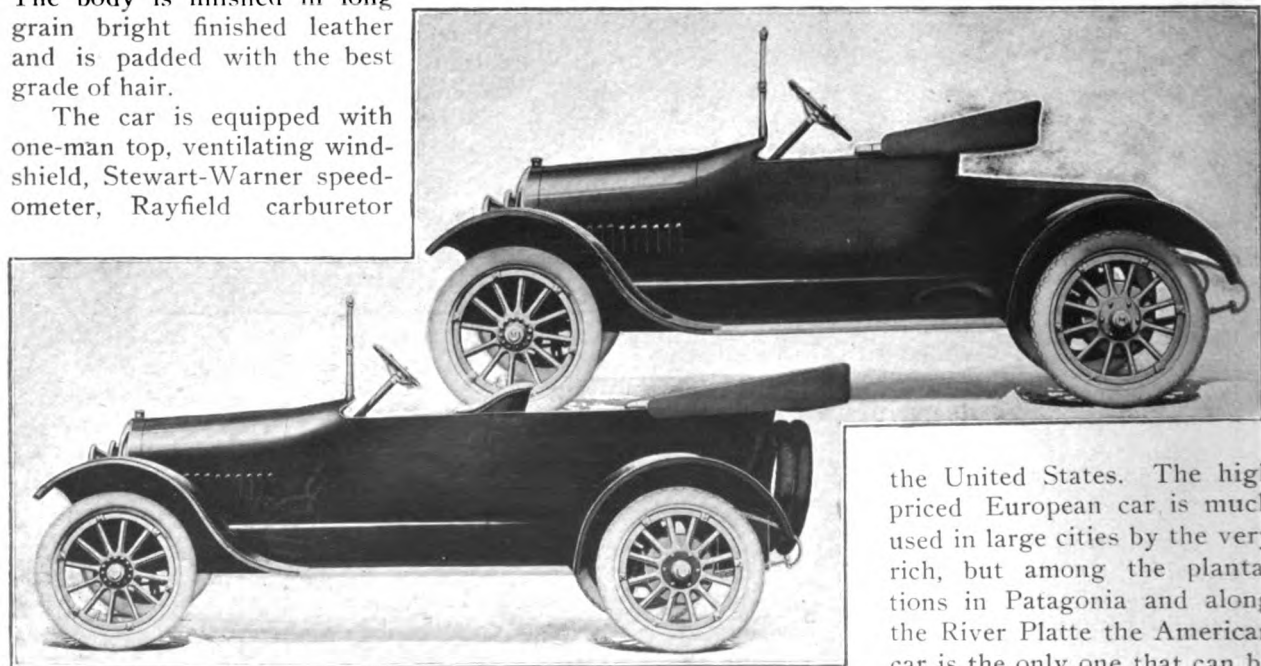
Remy electric starting and lighting equipment is used in connection with a Willard 80 ampere-hour, six-volt storage battery. Flexible aluminum conduits are used to carry all wires. Special attention has been given to securing the electrical terminals, and where necessary lock washers are used under the nuts.

The T. W. Warner Company's standard irreversible steering gear is employed, which prevents road shocks being transmitted to the driver. The fenders are a crowned type. The wheelbase is 120 inches and the tread 56 inches.

AMERICAN CARS FOR ARGENTINA.

The new statistics of American imports into the Argentine will show a very large increase in automobiles. The declaration of war on Italy's part greatly increased this business. Nearly one-fourth of the people in Argentina are Italians and great numbers of them went back to join the army.

This reduction in labor made quick travel and the substitution of automobiles for horses necessary in many places. Europe, of course, has nothing to offer in the way of a cheap, sturdy car, so that the only possible source of supply was



The Madison Six Roadster and the Touring Car Designed for 1916.

the United States. The high priced European car is much used in large cities by the very rich, but among the plantations in Patagonia and along the River Platte the American car is the only one that can be used successfully.

THE C. G. P. SPECIAL LIGHTWEIGHT CAR.

DESIGNED to have the qualities that his experience as a driver and tourist dictated were essential in a light weight car, having ample power and being extremely economical of operation and maintenance expense, Dr. Charles G. Percival of New York City, president of the Light Car Association of America, transcontinental motorist and the first man to drive a car in Alaska, has built a machine from his designs that is known as the C. G. P.

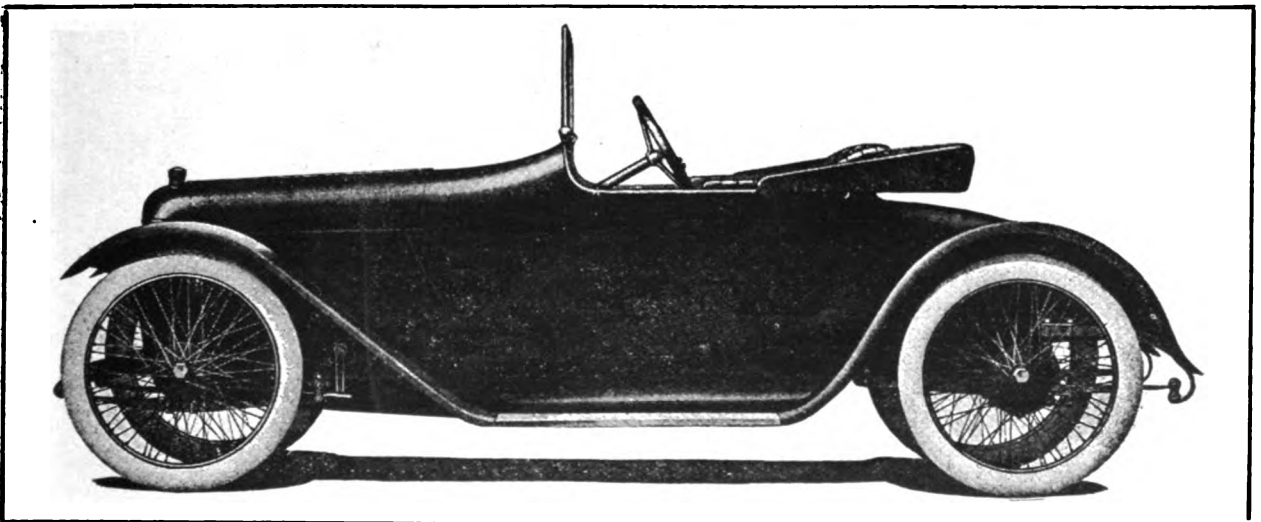
This car is for his own use and Dr. Percival's intention was to obtain speed through engine efficiency, fuel and lubricant economy from good carburetion and carefully developed ignition, and minimum tire wear from light weight and flexibility of the engine, as well as from the use of wire wheels.

The car built is a roadster, but it could be equipped with a touring body for four passengers without greatly adding to the weight or materially lessening the speed. The wheelbase is 104 inches and the tread 48 inches, the latter dimension being less than the standard because it has been found highly satisfactory in foreign practice; experience with the car has shown its riding qualities have not suffered, while its control has been decidedly improved.

The machine has a Farmer unit power plant that includes a four-cylinder water-cooled, four-cycle, vertical, L head engine, with cylinder bore of $2\frac{3}{4}$ inches and stroke of four inches, a leather-faced cone clutch and a selective sliding gear transmission gearset having three forward speed

ratios and reverse. The cylinders and the crank-case are cast en bloc with the intake and exhaust manifolds integral, with ample water jackets. The crank case is a barrel type with a separate oil pan. The cylinder head is a separate casting. The S. A. E. rating is 12.1 horsepower, but the maker claims it will develop 18. The crankshaft is mounted on two bearings of die cast babbitt. It is $1\frac{1}{2}$ inches diameter, with crankpins $1\frac{3}{8}$ inches diameter.

The valves have nickel steel heads and carbon steel stems. The engine is lubricated by a circulating constant level system by a plunger pump actuated by an eccentric on the camshaft. The engine is cooled by a thermo-syphon circulation of water through a bull-nosed, copper plated radiator and by a fan mounted on a ball bearing on an adjustable bracket, driven by a belt. The fuel is fed through an automatic float feed H & N carburetor. The ignition is by a low-tension Berling N44 magneto with two sets of Pecco double-insulated spark plugs, one over the piston and the other over the intake valve of each cylinder. This ignition system is claimed to give 15 per cent. more efficiency from a given volume of fuel, greater flexibility when throttled on the high speed ratio, about five miles an hour more speed, and to reduce carbonization surprisingly. The engine is equipped with an Allis-Chalmers single unit starting and lighting system, the motor generator being coupled to it by silent chain. The power plant is suspended at three points.



The C. G. P. Roadster, a Light Weight Car Designed by Dr. Charles G. Percival, President of the Light Car Association of America, for His Own Use.

The drive is by shaft with a single universal joint that is enclosed in a torque tube, the driving and braking stresses being taken by radius rods. The frame is a pressed steel channel section $3\frac{1}{2}$ inches width, that is suspended on semi-elliptic Titanic springs 32 inches length and $1\frac{3}{4}$ inches width forward and $\frac{3}{4}$ elliptic, 48 inches length and $1\frac{3}{4}$ inches width at the rear, the rear springs being mounted on brackets outside the frame. The axles are Weston-Mott make, the rear axle being a conventional semi-floating type with bevel gear drive having 4:1 reduction, and the front axle is tubular. The rear axle bearings are Hyatt and the front axle bearings New Departure. The drive is left side and the control levels are in the centre. The brakes are external contracting and internal expanding on and in 10-inch diameter steel drums on the rear wheels, the bands and shoes being faced with Raybestos. The wheels are triple laced Houk wire constructions, fitted with 30 by $3\frac{1}{2}$ tires.

The speedster body is sheet metal, a streamline design with a bucket cowl 18 inches width, with a deep turtle back deck at the rear. There is one door 22 inches width at the right side. The seats are 22 inches width and staggered eight inches. They are smooth upholstered in leather. There is a space 30 by 16 by 14 inches under the sloping rear deck for storage. On the rear is a spindle on which is carried a spare wheel. The fenders and running boards are pressed steel. Under the cowl is a mahogany instrument board on which is a sight feed oiler gauge, a rim wind clock, the lighting and ignition switches and an electric light. The head lamps are 11 inches diameter.

Dr. Percival recently returned from a tour from New York City into Canada and return and he states that the machine was driven from 36 to 40 miles to the gallon of fuel, that its maximum speed was 60 miles, and that it was very steady and free from skidding on the road. The car weighs 1200 pounds.

GOODYEAR TIRE COMPANY'S RECORD.

For a week the district and branch managers of the Goodyear Tire and Rubber Company were in Akron recently talking over plans for the new year and the record of the one just past. The company's estimate of 2,000,000 tires for the year was reported to have been reached and passed.

F. A. Seiberling, president of the company, predicted that the United States would absorb a million cars yearly for the next three years and that the Goodyear Tire Company would receive

its share of the business.

For several months the factory has been running at capacity 24 hours a day to keep production even with sales, and seven acres of new buildings are being erected to expand the output.

The great strides the business is making is not confined to the automobile tire department. Some new specialties in mechanical goods are meeting with a large sale. The company expects to make three-fourths of the motorcycle tires used in 1916. The bicycle tire business has doubled in one year.

SWISS ARMY TRUCK EXPERIENCE.

The Internal Gear Drive Association of Detroit has received a letter from Major Hamberger of the Swiss general staff, discussing the experience of the Swiss army with motor trucks since it mobilized at the beginning of the European war. At the time of mobilization no standard type of army truck had been adopted and all types of drive—chain, internal gear and cardan—were used. The internal gear drive has been found to be satisfactory on trucks up to five tons.

The army is stationed largely in the Alps, on the borders of the country, and there are many steep grades over which hauling must be done. For this work comparatively heavy motors of 45-horsepower are mounted in three-ton trucks with four-speed gear sets. The trucks carry 75 per cent. of their rated load and even on very heavy grades maintain speeds of between nine and 10 miles per hour.

Major Hamberger's letter is the first report on truck performances received from a member of a European general staff. It goes into many details of design and copies have been given to engineers of American manufacturers interested in the use of the internal gear drive for trucks.

COMING EVENTS.

November.

- Nov. 1-3—Show, Pasadena, Cal.
- Nov. 12-20—Show, Providence, R. I.
- Nov. 18—Race, 150-mile Grand Prix, Arizona.
- Nov. 20—Road race, Carona, Cal.
- Nov. 29-Dec. 4—Electric Prosperity Week.

January.

- Jan. 1-8—Show, New York City.
- Jan. 8-15—Show, Philadelphia.
- Jan. 8-15—Show, Cleveland, O.
- Jan. 22-29—Show, Chicago.
- Jan. 24-29—Show, Buffalo.
- Jan. 29-Feb. 5—Show, Minneapolis, Minn.

February.

- Feb. 7-12—Show, Kansas City, Mo.
- Feb. 19—Show, Newark, N. J.
- Feb. 21-26—Show, Omaha, Neb.
- Feb. 21-26—Show, Syracuse, N. Y.

March.

- March 4-11—Truck show, Boston, Mass.

PRACTICAL MOTOR CAR REPAIRS.

WHEN car has been fitted with new bearings throughout, it will frequently be almost impossible to turn the motor over by hand. When

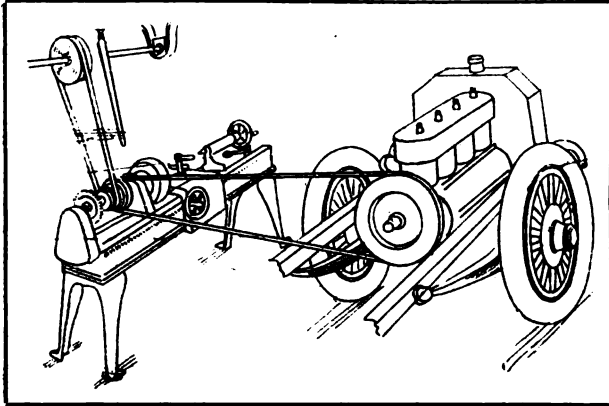


Fig. 99—Connecting Flywheel with Lathe to Loosen Tight Bearings.

such is the case it would be injurious to operate the motor on its own power, on account of the heat generated. Many mechanics tow the machine for a considerable distance so as to allow the bearings to wear in before starting the motor. It is good practise, but a much better method that will afford the same result is to remove the body of the car and run a belt from a nearby lathe to the flywheel of the engine, as illustrated in Fig. 99. The engine should be allowed to run in this manner for at least a half day. This principle is carried out in automobile factories, the operation being termed blocking the motor.

PATCHING CEMENT.

A very satisfactory cement for uniting leather and rubber can be made by dissolving 100 parts finely chopped India rubber, 15 parts rosin and 10 parts shellac in carbon disulphide. The vessel in which the solution is stored should be securely sealed and shaken from time to time. Carbon disulphide is highly volatile and should not be exposed to a naked flame.

SOLDER.

It is always advisable to purchase solder, but it can be easily made by placing equal parts of lead and block tin in a ladle and melting them. Stir the mixture well and then run off into a mold. The quality of solder can be tested by

holding a strip close to the ear and then bending. If a crackling noise is heard, the solder is of good quality, but if none is heard, the solder contains too much lead.

HOME MADE EMERY GRINDER.

A small emery grinder for a small garage or repair shop is valuable equipment. While there are many types to be obtained on the market, a simple, yet practical model, as shown in Fig. 100 can be easily made by the individual who possesses an average amount of mechanical ability. Saw off the top bar just in front of the seat post of an old bicycle frame. Also saw off the lower braces about eight inches in front of the hanger. Fasten the frame to a wood stand after the same manner as shown in the illustration. When the tire is removed from the rear wheel, the latter will serve as a drive pulley. The seat can be made of a length of pipe which is bent at the top to receive a bicycle saddle. The pipe can be anchored to a socket in the floor.

VALVE FOR GASOLINE TANK VENT.

Several types of gravity feed gasoline tanks are equipped with a large vent hole in the filler cap. When a large amount of fuel is carried, and when travelling over uneven roads, the gasoline splashes through the opening. The arrangement shown in Fig. 101-I will remedy this trouble. Cut a small, round piece about half the diameter of the filler cap from sheet tin and

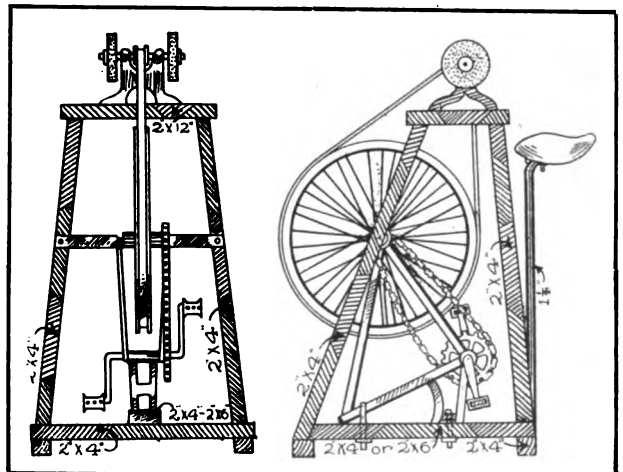


Fig. 100—The Components of a Home-Made Emery Grinder.

through the centre secure a thin piece of wire. The wire is then passed through the hole in the cap and through a small piece of screening and

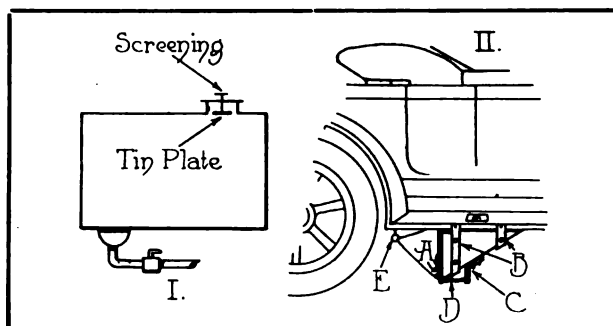


Fig. 101—I, Location of a Valve for Gasoline Tank Vent; II, a Home-Made Sand Box Attached to the Running Board.

soldered. The piece of tin plate serves as a baffle to the splashing fuel.

ATTACHING SAND BOX TO CAR.

Many accidents could be averted if dry sand could be placed under the rear tires when making an emergency stop. The sand affords the tire a firm gripping surface. Apparently the best location for a sand box is under the running board, directly in front of the rear tire. The box should be about the width of the running board, about a foot long and a foot deep. Shape the box as shown in Fig. 101-II, and at the end attach a small trap door with hinges, as at A. Secure the box to the running board by two metal straps, as at B.

The sand supply can be replenished through a small cover in the running board, and the cover can be weighted on the inner side so that it cannot jar off, or thumb screws can be used to retain it. At the bottom of the box should be fitted a small, but strong bracket of the shape shown at C. A very strong spring, D, should then be run from the bracket to the trap door in the box.

The operation of the box is simple. A cable is run from the trap door to a small pulley located at the rear of the running board, as shown at E, and the cable then extended to any place convenient for the driver. In the winter, a mixture of salt and sand used in the box affords a very good gripping surface on snow and ice. Of course a box should be fitted to each running board.

Where oil will not serve satisfactorily as a cooling agent when drilling metals, substitute turpentine, which will permit the drill to bore through hard metal and yet retain its temper.

HOME-MADE HOT AIR DEVICE.

With the approach of cooler weather owners of several earlier types of cars must provide some means of supplying warm air to the carburetor. The late models are equipped with devices, but few of the earlier models are thus fitted. Fig. 102 presents a plan whereby the average owner can easily make a warming device for the model F Schebler carburetor. The bowl of this carburetor, A, is held by a hexagon nut, B. Remove the nut and drill and tap each side of it to receive a small machine screw.

Shape a piece of sheet brass around the nut, as shown at C, retaining the same by the screws. A hood, illustrated at D, is then formed of sheet brass. If difficulty is encountered in shaping, any tinsmith will do it at slight expense. When constructing the hood piece bear in mind that the cut-out section must be sufficiently large to permit entrance of air when attached to the manifold. Attach the hood to the exhaust manifold by riveting a piece of sheet brass across the top of the hood.

Connect the heater with the carburetor by a length of flexible metallic tubing, which is not expensive. The end attached to the hood can be soldered, while the other end is retained by slipping the hose over the nut piece and then drilling a small hole through the walls of both pieces and inserting a cotter pin. The complete assembly is shown at E.

When it is desired to have a smooth surface to the metal being filed, the face of the file should be covered with chalk when the finishing cut is being made. This prevents the small pieces of metal from adhering to the file and scratching the work.

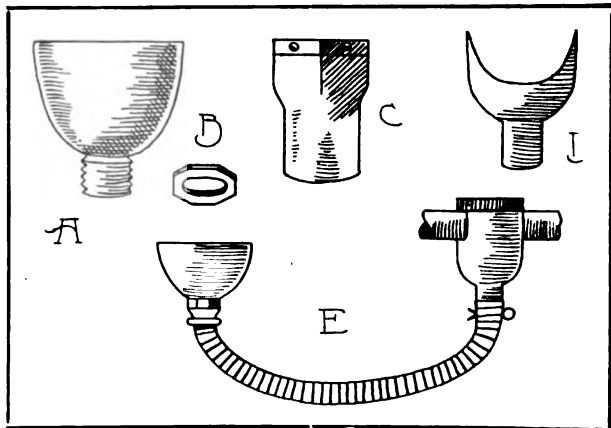


Fig. 102—The Parts and the Assembled Unit of an Easily Made Carburetor Stove.

SUGGESTIONS FOR THE FORD CAR OWNER.

The Power Transmission System of the Chassis from the Engine to the Rear Axle, Showing the Different Components and Construction Details of Assembly.

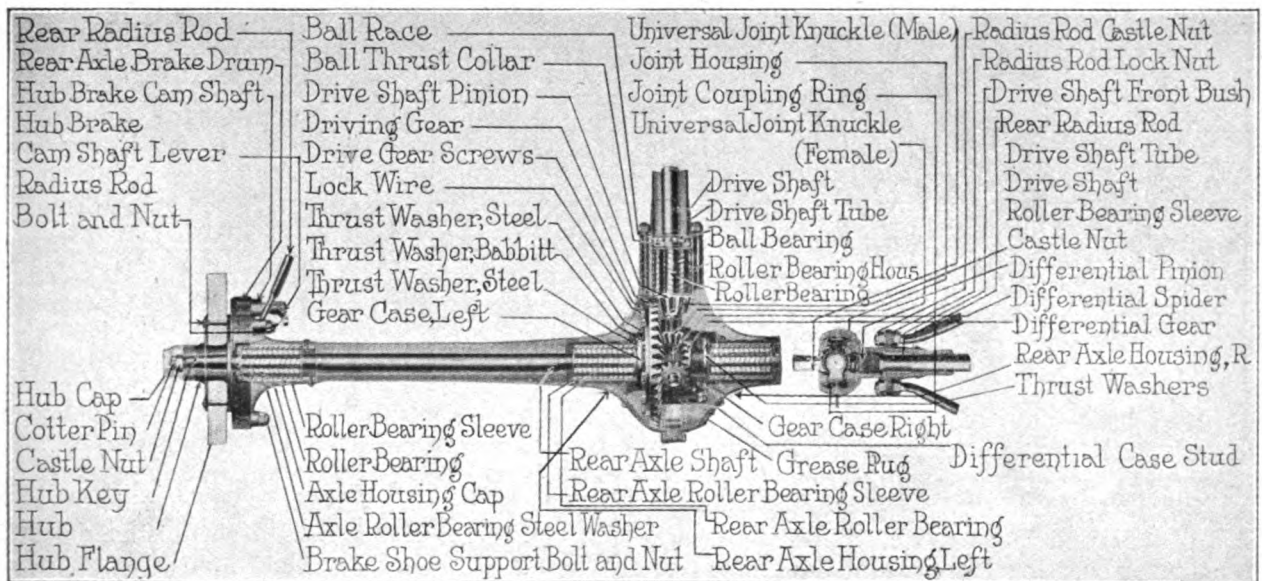
The 34th article dealing with the construction, operation, maintenance, care and repair of the model T Ford chassis is devoted to a consideration of the power transmission system, from the gearset to the rear axle.

TRANSMISSION of power is the greatest problem with which the automobile vehicle engineer has to deal. Power can be transmitted, but the desire is to transmit it efficiently, so that the cost will be minimum and the power available will be the highest percentage of what is produced by the engine. The production of energy is dependent upon the design of the engine and the condition of operation.

more care and is in much better operating condition. There will, no doubt, be instances where the maximum stated will be considerably exceeded, but these cannot be accepted as representing average results.

The Actual Efficiency Obtained.

At this time a reiteration of the facts, that there is a heat loss of from 50 to 55 per cent. in the water jacket and from 30 to 35 per cent. in the exhaust and in radiation in the well designed engine is essential. One may reasonably assume that the engine as normally driven will not have



The Rear Axle Assembly of the Ford Chassis, Showing All the Components, the End of the Torque Tube, Carrying the Universal Joint, Being Placed Beside the Axle for Convenience in Illustrating the Construction.

The reader has been informed that the power realized from the combustion of fuel in the cylinders of the engine is but a small percentage of the actual value that may be theoretically realized, and that this extreme loss is resultant from necessity of cooling the engine, by discharge of heat with the exhaust and by radiation.

The thermal value of fuel can be accepted as 100, and the thermal efficiency may be placed as from 10 to 18 per cent., the lowest figure being realized from the well worn and poorly maintained machine, while the highest will represent the result with the engine that receives decidedly

the power capacity that might be obtained when given expert care and operated in favorable conditions. This being so, 15 per cent. thermal efficiency is a fair estimate of what may be expected from commercial gasoline.

Because of this great loss from thermal value of fuel there is the more need, from an economical viewpoint, if nothing else, of conserving the power that is produced by an engine, for one can understand that if this is materially diminished the useful work will be greatly decreased. Much depends upon the manner of transmitting the power from the engine to the road wheels of the

vehicle, and by minimizing friction the losses may be made comparatively slight. By this is meant that by good construction the useful power applied to the rear wheels may be as high as 95 per cent. with every condition favorable, and it may be not more than 75 per cent. if the machine be worn and the lubrication poor.

Light Weight Means Greater Efficiency.

The efficiency from Ford engines ought to be reasonably uniform provided that conditions for operation are equal, and obviously the power output ought to be up to what may be regarded as a standard, but the average motorist is disposed to gauge results by a miles-a-gallon measure, which is obviously extremely vague, and ought never to be depended upon unless comparison can be made of records over one route and when traction is not influenced by weather.

The weight of a Ford car will approximate

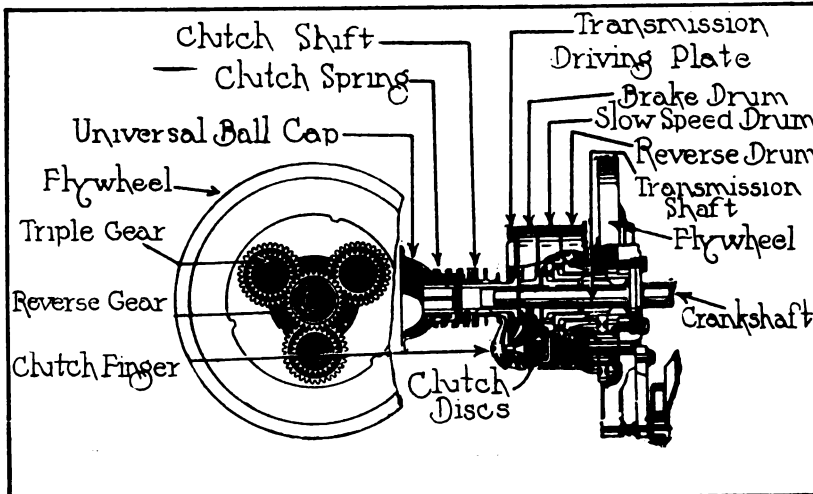
when driven direct it is as efficient as any other, the gearset serving to supplement the flywheel in storage of energy; third, it is a more economical construction than the selective sliding; fourth, because the two-speed ratios insures against abuse of the engine by compelling the driver to use the low ratio when the load becomes too heavy for the high ratio to carry.

The Ford Power Transmission System.

The gearset is fully enclosed in the case formed by the rear extension of the crank case or engine housing, and the driving plate that is bolted to the brake band has a sleeve that slips on the rear end of the transmission shaft of the flywheel. The internal bore of this sleeve is squared at the rear end, and this sleeve extends to the rear of the engine case.

From this sleeve the power is transmitted by a shaft in which is a universal joint and a driving

pinion to a bevel gear that encircles a differential gearset that drives the axle shafts by which the wheels are turned. The power plant is mounted at three points—on the front frame cross member, and at either side on a frame side member. The axle driving shafts, the differential gearset and the main shaft are housed in the axle housing and the torque tube that extends from the axle to the power plant. The end of the torque tube is a housing for the universal joint that resembles a globe with a section cut away at the front side, through which opening



The Ford Planetary Gearset in Diagram, Showing the Position of the Universal Ball Front Cap That Forms a Part of the Ball and Socket Joint.

1100 pounds, and roughly one can say that there is a horsepower in engine rating for every 50 pounds. This is comparatively high power and is much in excess of what would be ordinarily provided for a machine of conventional design—probably 50 per cent. more than the average. With this capacity, and the assumption that the greater part of the time the vehicle will be driven on roads and in conditions where full power may be utilized, practically all of the driving is direct—that is, without reduction between the engine and the rear axle.

The transmission system gearset has been discussed at considerable length in previous installments, but statement should be made of the reasons why a planetary type is used. First, all the gears are constantly in mesh and there is no probability of damage from careless use; second,

ing a shaft stub that is made a part of the universal joint is extended. This stub is telescoped into the sleeve of the transmission shaft.

The construction of the Ford chassis is very light, and it is extremely strong for the weight of metal, for it is largely built of vanadium steel, and because of this lightness the frame is expected to flex or "weave" because of the stresses upon it. The position of the rear axle with reference to the frame will change vertically, and at either end, when a wheel contacts with a surface inequality, so that there is always a slight movement of the driving shaft at the universal joint when the machine is driven.

The thrust of the driving wheels and the braking effort upon the brake drums is through the rear axle housing, the radius rods and the torque tube direct to the globe and socket joint

in the rear of the engine case.

To meet the requirements for the comfort of the passengers the platform or floor of the car must be practically level, and this must be built upon the chassis frame. The engine, for numerous reasons, must be mounted as nearly horizontal as is possible, and as the body must be elevated above the rear axle so as to obtain practical spring suspension, the rear axle is normally below the level of the engine. As the rear wheels must be driven through the rear axle by a shaft, there must necessarily be more or less inclination of this shaft from front to rear.

The Use of a Universal Joint.

As the angularity of the shaft is changed by the weight of the load in the body and by the movement of the rear axle from contact with obstructions that cause deflection and reflexion of the springs, and sometimes to extremes, there must be no stresses upon it, for these would cause side pressure that would be destructive of the bearings and greatly reduce the effective power from friction. The shaft must be free to move in any direction and yet have the highest efficiency in transmitting power. This freedom is obtained through the use of a universal joint. There is loss of power when a universal joint is used, this being sometimes as much as 10 per cent., but this result cannot be avoided when this construction is necessary.

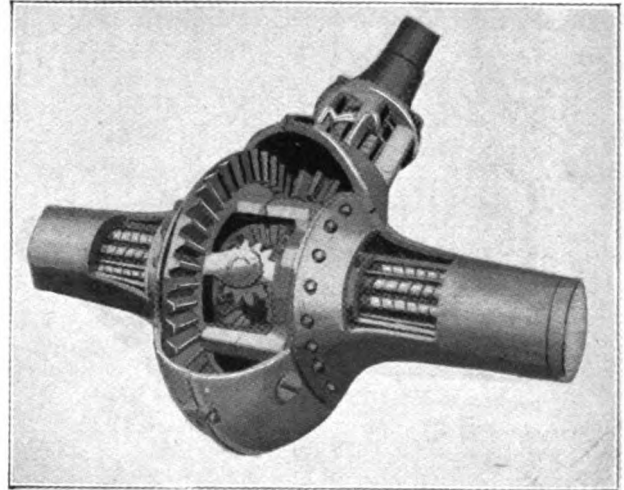
The universal joint of the Ford system is composed of three principal parts, these being what is known as a joint ring and two shaft stubs or knuckle joints. The ring is two half sections that are riveted together and when united form bearings for the trunnions or driving pins of the knuckle joints. These four bearings are spaced equidistant around the ring. The shaft stubs have each two yoke ends, the arms of which are set at an angle of about 45 degrees to afford clearance in the centre of the joint. Each arm has its trunnion or pin. One shaft stub is squared so that it will telescope into the sleeve at the end of the shaft of the gearset, this being the male member, and the other has a square hole machined into it which will telescope over the forward end of the main driving shaft that is in the torque tube. This is the female member. The front end of the main shaft is carried in a long plain bearing that is mounted in the torque tube directly back of the globe head, and this insures the shaft and universal joint at all times being clear of the tube and the globe-shaped housing.

Perfect Freedom of Driving Shaft.

The assembly to this point affords perfect freedom of movement of the shaft. The torque

tube and the universal joint housing are a single inflexible assembly. Before the assembly is made, however, a cap or cover is placed over the joint housing, this being known as the universal ball rear cap. This will fit snugly against the universal joint housing. The front universal joint cap is made with an opening through which the stub end of the male universal joint knuckle will project, and this is, with the rear cap, bolted to the rear extension of the engine case, the two forming a complete globe and socket joint.

When the assembly is completed the torque tube and the housing of the universal joint are enclosed within the universal ball, so-called, and there is freedom of movement of the shaft in any direction to a far greater degree than will ever be required and the driving effort of the engine is transmitted through the shaft to the rear wheels



The Driving Pinion, Bevel Gear and Differential Assembly of the Ford Rear Axle Cut Away to Show the Construction and the Positions of the Bearings.

and back through the axle housing and the torque tube to the rear end of the engine case without stress upon the system. No matter what the movement of the axle or the frame, there is always a uniform driving effort exerted upon the ball, and the area of the surfaces is so large that there is comparatively little wear. The universal joint is packed in grease, which lubricates the joint and the ball and the roller bearing.

The rear end of the driving shaft is mounted in an annular ball bearing and a long roller bearing, fitted at the rear end of the torque tube, and at the end of the shaft there is a beveled pinion that is meshed with the large gear that is part of the differential assembly. The roller bearing takes the side pressure and radial loads of the shaft, and the ball bearing takes the thrust of the

bevel pinion on the shaft.

The Differential Housing and Gearset.

The end of the torque tube is bolted to the central section of the rear axle housing. This housing is formed of two sections of pressed metal that are belled to afford space for the differential gear. The division is vertical and the two are secured by a series of bolts. To these the axle tubes are riveted, these being substantial sleeves in which there is ample clearance for the driving axles that extend from the differential gearset to and beyond two large roller bearings that are fitted in the outer ends of the tubes. To these axle ends the wheels are keyed, and the inner ends of the shafts are keyed to the sleeves of the axle stubs on the outer sides of the two gears of the differential gearset. These stubs are mounted on heavy roller bearings, and between the inner ends of these bearings and the differential gears at either side are two steel washers and one babbitt metal washer that are intended to take the end thrust of the axle shafts.

From this statement one realizes that the roller bearings that carry the differential gearset also serve as bearings for the inner ends of the axle shafts, and these bearings are supported by spiders and by the axle tubes, the spiders being riveted to the differential housing. On these bearings the differential gearset turns as a unit, and with it the shafts so long as both wheels are in contact with the ground. When one of the wheels is off the ground this wheel may be turned and the other will not be moved. If both wheels are off the ground and there is no resistance upon them, both wheels will turn if the engine is started, but they will turn in opposite directions, one forward and the other backward.

The Rear Axle Reduction.

The reader understands that the rear axle is driven by the pinion on the end of the main driving shaft, which meshes with the large bevel gear that is bolted to the left differential gear, the differential gear being smaller in size. The driving shaft is turned at engine speed when it is driven direct, or on the high ratio, and as the pinion is much smaller than the large bevel gear, there is a substantial reduction in the speed of the axle shafts as compared with driving shaft. There are 11 teeth in the driving pinion and 40 teeth in the bevel gear, so the reduction is $3\frac{7}{11}$, or 3.63, as one cares to express it. Or, to state it another way, the engine shaft will turn 3.63 times for every revolution of the road wheels. When the engine is driven in the low or reverse ratio there is so much additional reduction in the transmission gearset.

The Purpose of the Differential Gear.

The purpose of a differential or compensating gear is to drive the axle shafts in a direct line with the same effort by both, but, when turning, to have that wheel that is outside—that must move the fastest—drive the vehicle, the inside or slowest moving wheel serving as a pivot, or even turning backward, if the turn should be in so short an arc. The reason for this is that if both rear wheels were always turned forward at equal speed the tractive effort would be exactly the same with either and no turn could be made.

The rear wheels of a vehicle with a fixed rear axle that is drawn are free to move and turn only in ratio to the distance that must be covered. The forward wheels of a vehicle that is drawn must either be pivoted so that they may be turned, or the axle must be turned to change the direction in which it may be moved. This is the case with the ordinary horse drawn wagon or carriage. When the power is applied to front wheels of vehicles, as it is with several makes of service wagons, the wheels are pivoted in the usual manner, and the driving shafts are divided and are fitted with differential gears, so that one wheel can be driven faster than the other.

There are a number of different devices for balancing or compensating the speed of the driving shafts of the axles of automobile vehicles, but thus far the bevel gear type that is used in the Ford chassis has been proven the most practical, and one can with certainty affirm that its use is well nigh universal.

(To Be Continued.)

FORD RACES BIG SUCCESS.

Seven thousand spectators saw a large number of Ford cars race eight heats at the Michigan state fair in Detroit, Oct. 17, and the event was so great a success that many more like it will probably be held under the direction of the International Motor Contest Association.

The drivers were all amateurs, but owing to care in instructing them before the race and in having the cars examined for any weaknesses, not an accident occurred. The speed in the various events, which were run on the elimination plan, averaged about 50 miles an hour. Ford accessories valued at about \$300 and cash prizes totalling \$500 were given.

Another event of the same sort will be held in Detroit, probably on July 4 next year, and it is probable that similar events will be promoted in other places.

THE AUTO AND THE R. F. D. ROUTES.

THE Chamber of Commerce of the United States is upholding Postmaster-General Burleson in his efforts to reorganize the postal service with the motor car and the current number of the Nation's Business, the publication of that organization, contains an important article approving his course.

It is pointed out that as each motor vehicle takes the place of approximately two wagons, a considerable reduction in the number of carriers is required and this results in political back pressure.

Every effort is being made by the department, however, to retain efficient and experienced carriers. By request of the postmaster-general the civil service board has granted a handicap of three per cent. in the examinations to present carriers who seek permanent appointment as automobile carriers. As far as possible all old carriers are being reappointed.

The appropriation for rural free delivery for the current year is \$53,000,000, the same as it was last year. As a result of economies effected next year's appropriation will be only \$49,000,000. From \$25,000,000 to \$30,000,000 of the cost of the present service is not a part of the income of that service and is a loss.

The introduction of automobiles is only one phase of the work to secure greater efficiency in the service. The economy of time in auto delivery is pointed out as of special value to business and business men. As the auto can go twice as far into the country as the wagon it increases the "reach" of the service in many places.

The automobile is to be introduced only in localities where road and weather conditions make it probable that it can be used for at least eight or nine months of the year. If the motor car can only be relied upon for eight or nine months of the year the maximum salary of \$1800 a year is granted so that horse rigs can be hired for the interim, but if it can be used all the year around \$1500 is paid.

For the new service the carrier is asked to furnish a modern power vehicle of 800 pounds carrying capacity and a cubic space of at least 80 feet. This is approximately twice as large as the usual horse wagons. Yet the requirement is met by nearly all the standard makes of cheap cars.

Specifications for a standard mail delivery vehicle have been provided, and follow closely the design of the light vehicles used in collection

service in the cities. Mr. Burleson is trying to secure favorable terms of purchase for the carriers, including the remission of the agent's commission and installment payments.

So far the following routes have been established:

State	Effective July 1	Effective Aug. 2	Effective Sept. 1	Effective Oct. 1	Total
Arkansas	1	..	1
Oklahoma	88	16	..	104
California	24	2	..	26
Georgia	64	30	5	99
Colorado	1	1	..	2
Delaware	1	..	1
Pennsylvania . .	2	..	13	..	15
Kansas	3	..	..	3
Louisiana	1	..	..	1
Mississippi	2	..	2
Florida	13	2	..	15
Texas	14	2	..	16
Indiana	14	..	14
Iowa	36	..	36
Total	2	208	120	5	335

Another extension of service made possible by the motor car will be that of supplying city and not rural delivery to the outlying market gardening sections within 25 miles of large cities. This fast suburban express service will be useful to city merchants and packages will take the local instead of the first zone rate.

VELIE NEW SIX COUPE OUT.

A new coupe body seating four passengers has been offered by the Velie Motor Vehicle Company, Moline, Ill., with its "Biltwel" six chassis. The main seat is wide enough for three persons. The driver is seated slightly ahead of the other two passengers, where he has greater freedom of movement. A fourth seat is mounted on a stationary pedestal and may be revolved in any desired direction. Drop windows of the sashless variety are used. The upholstery is dark blue whipcord material, which satisfactorily matches the Velie blue exterior. There is a large compartment in the rear deck for extra tires.

AUTOMOBILE SHOW AT WICHITA.

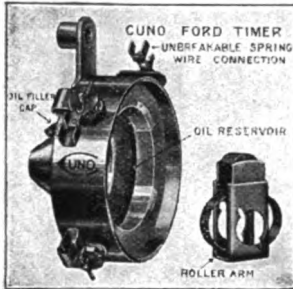
In connection with the international wheat show an automobile exhibit began in Wichita, Kan., Oct. 4. It is estimated that 100,000 farmers visited the displays. All of the local dealers did not exhibit, but there was a representative display of 1916 models. Many of the local sales rooms were especially decorated for the occasion.

FORD CAR ACCESSORIES AND EQUIPMENT.

CUNO TIMER FOR FORD CARS.

Specially Constructed Timer Designed to Eliminate All Ignition Trouble on Model T Ford Cars.

After long experience in timer construction, the Cuno Engineering Corporation, Meriden, Conn., is producing the Cuno timer illustrated herewith. It is especially designed for the Ford car. The case is made of steel, which, although light, is practically indestructible. It is black enamelled to prevent rusting. The fibre ring is made of specially treated hard, gray bone fiber and is not easily subject to wear.



Cuno Timer for Ford Cars.

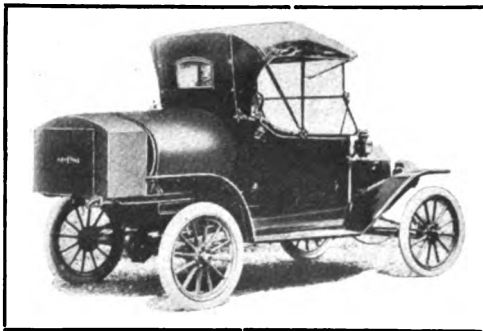
A notable feature is the oil well, which is formed by a groove behind the fiber ring. Lubrication of the timer is from this source by the splash system and the oil can be replenished through the filler cap in the case. The roller and pin are made of special steel and hardened. The roller is carried in a slide and is pressed firmly against the contact points by a large, flat spring. The spring wire terminals used in this timer are designed to make it impossible for wires to pull out or connections to break. It is possible to place the wire in any position desired.

Installation is simple and can be accomplished in a few minutes. The device retails at \$1.50 and is guaranteed against defects in workmanship or material.

GASOLINE TANK BODY.

Fuel Tank Which Can Be Attached to the Ford for Commercial Purposes—It Is Interchangeable.

Prompt service is one of the greatest assets which any oil company can possess. To do this, however, some means must be provided for transporting the gasoline



Gasoline Tank Body.

or oil quickly to the owner or garage. The Ohio Welding and Manufacturing Company, 828 West Sixth street, Cincinnati, O., is producing the quick delivery gasoline tank body for Ford cars shown in the accompanying illustration. The tank has capacity of 100 gallons. The full tank of gasoline, together with extra cans of lubricating oil, make about the correct carrying weight for the Ford car. The tank is interchangeable—for commercial and pleasure purposes. When attaching the tank to the car for the first time the operation requires between one and two hours, after which it can be attached or detached in about five minutes. The equipment is furnished complete with faucets, air vent, etc., and can be obtained with or without the box at the rear, in which are carried measures, funnels, etc.

HOYT MAGNETOMETER.

An Instrument for Determining the Efficiency of the Magneto Used on Model T Ford Cars.

The Hoyt magnetometer illustrated herewith and manufactured by the Hoyt Electrical Instrument Works, Penacook, N. H., is designed to indicate the efficiency of the magneto on the Ford car at all times. The instrument is two inches in diameter and fastens to the dashboard.

The sole purpose of this device is to simplify ignition troubles by indicating the condition of the magneto, which is the foundation of the ignition system. As can be seen in the illustration, the four letters P-M-G-E are placed over the scale. When the finger is pointing at "P," it indicates that although the magneto is generating, it does not satisfactorily ignite the charges at all times and is to be considered as in poor condition. If the magneto, while operating without skipping shows an appreciable lack of power, this is indicated on the scale by "M," signifying medium condition. The lowest point at which efficient ignition takes place is designated by "G," meaning good. Excellent condition is shown by the letter "E."



Hoyt Magnetometer.

When installing it is not necessary to disturb any of the regular wiring of the car. The magnetometer should be located at a point on the dashboard where it can be easily seen by the operator.

The strength of the current generated by the Ford magneto is proportionate to its speed and it therefore cannot be expected that a magneto operating at a slow speed will register the efficiency of the magneto that is operating at a high rate of speed. A magneto, which will register "G" when the car is operating 15 miles an hour and over, is in reasonably good condition.

The retail price of the Hoyt magnetometer is \$4. The instrument is guaranteed as to workmanship and material for one year from date of shipment.

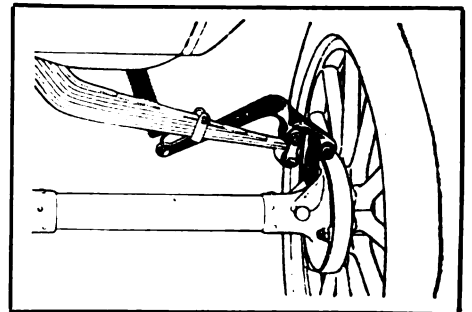
DIXIE SHOCK ABSORBER.

Low-Priced, Lever Constructed Shock Absorber Designed for Ford Car—Speedometer Bracket Supplied.

The Dixie Manufacturing Company, Indianapolis, Ind., is marketing the Dixie shock absorber for Ford cars. As is shown in the accompanying illustration, it is of lever construction and there are no sliding parts or friction.

The shackle holes in the levers are fitted with bronze bushings, and the rear hangers are made of the best drop-forgings. Absolute safety is assured by the use of the regular Ford perches in the front and drop-forged parts in the rear.

A special speedometer support bracket for use on 1915 model Ford cars is furnished with each set of absorbers. This attachment permits the speedometer shaft to clear the top of the shock absorber when turning cor-

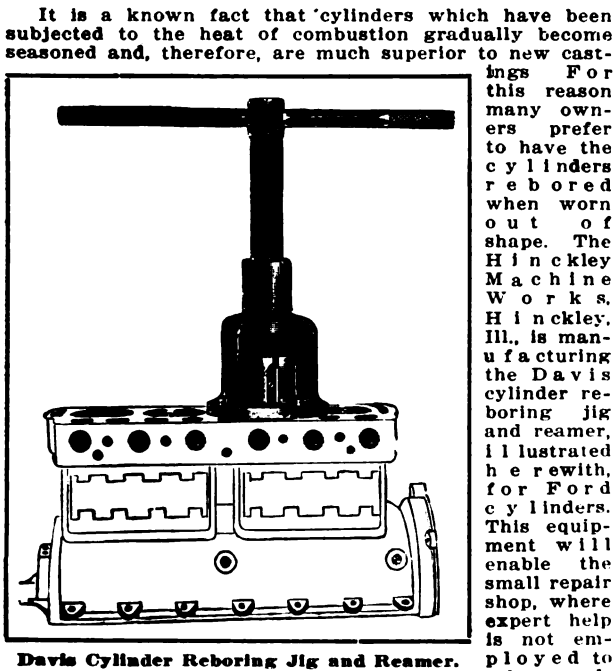


Dixie Shock Absorber Installed on a Ford Car.

ners. The retail price of a set of four absorbers is \$10. They are fully guaranteed for one year from date of sale and any part found to be defective will be replaced. When ordering it should be stated whether they are to be used for touring cars or roadsters.

DAVIS CYLINDER REBORING TOOL.

It Enables Inexperienced Workmen to Rebore Ford Cylinders with as Good Results as by Expensive Machinery.



The company declares that a workman can with the Davis device rebore a set of four cylinders in one hour, which includes the time required for setting up. As the tool centres itself, it is impossible even for the inexperienced man to spoil the work. The reamer, which is adjustable for size, rebores the cylinders to 1/32 of an inch oversize. When the blades become worn they can be easily set out and reground at slight expense. The equipment is listed at \$75, from which a liberal discount is allowed to the trade.

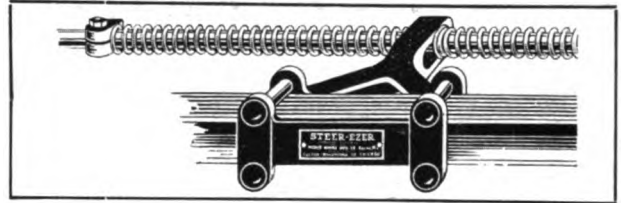
WALKER STEER-EZER.

It Insures Safe Steering Under All Conditions and Saves Tire Wear by Eliminating Wobble of Front Wheels.

The Walker Manufacturing Company, 1511 Michigan avenue, Chicago, Ill., is marketing a device known as the Walker Steer-Ezer, which is designed to maintain the front wheels of the Ford car in a straight ahead position, regardless of road conditions. This is accomplished by two strong reciprocating coil springs placed over the tie rod and held in place by a clamp that fastens to the front axle. This spring absorbs all irregularities of the wheel action and produces the same effect as the irreversible steering gears installed in the higher priced cars.

Installation is simple and can be accomplished quickly with a common wrench. The attachment eliminates all rattling of the steering apparatus, and also prevents

wobbling of the wheels, thus saving tire wear. Car owners are allowed to give this device a 10-day free trial



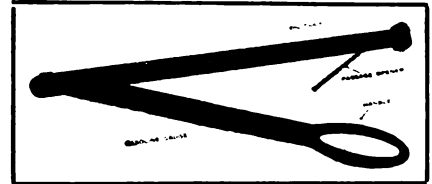
Walker Steer-Ezer Installed on a Ford Car.

and if not satisfactory in every detail it may be returned. The retail price is \$3.75.

OBSERVER KEY.

With This Tool the Owner Need Not Crawl Under Car to Open Oil Cock on Ford Cars.

The oil and gasoline observer key illustrated herewith and manufactured by the Charles W. Manzel Company, 309 Beard avenue, Buffalo, N. Y., is designed especially for the convenience of the Ford car owner. This device makes it unnecessary to crawl under the car to determine the oil level. The wrench at the end engages the oil cock and enables the operator to turn it by a mere twist of the wrist.



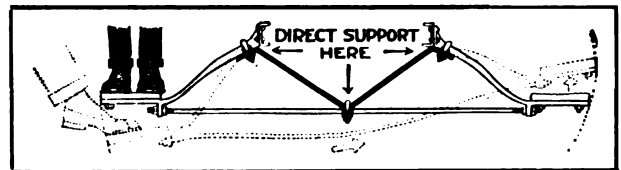
Oil Observer Key.

The handle end has an accurate scale—for measuring the gasoline, from one gallon to 10. A folding wire needle is also attached to the upper end of the key and is used for clearing clogged passages of oil, radiator or carburetor cocks. The tool is made of polished steel, copper plated and is oxidized black. When not in use it can be folded in the same manner as a jack knife and carried under the seat. It is absolutely guaranteed and retails at 50 cents each.

RUNNING BOARD BRACES.

They Are Designed to Eliminate Strain to the Chassis and to Minimize Noise Due to Loose Parts.

The Casey Asco Manufacturing Company, 1514 Grand avenue, Kansas City, Mo., is marketing a chassis reinforcement for the Ford car, known as the Casey running board brace. As can be seen in the accompanying illustration, the design is based on the same principle as the three-point suspension used in bridge building. It increases the rigidity of the truss rod and frame and eliminates the strain on the rods and fenders. The manufacturer declares that jumping on the step of the car with both feet cannot strain the chassis. The dotted lines in the illustration are intended to show how the running boards ordinarily give when a person steps on them. It



Casey Braces for Ford Car Running Boards.

is obvious that if the strain is eliminated the parts will not wear loose and result in annoying rattles. The braces retail at \$2 per pair. Installation is simple, the only tool needed being a wrench. No drilling or fitting is necessary.

INDUSTRIAL HAPPENINGS AND COMMENT.

THE Splittdorf Electrical Company, Newark, N. J., is making giant strides in the ignition field with the Dixie magneto. Equipment contracts for the English built Daimler, the Italian Fiat and Isotta and the French Renault have been secured and deliveries are now being made.

The Briscoe Motor Company, Jackson, Mich., has completed plans for the construction of a new \$100,000 building. This addition has been made imperative, although the Briscoe company has leased every available plant in that city and is negotiating for the establishment of a factory in Canada. Everything in the new Jackson plant is to represent the most advanced engineering experience as applied to the manufacture of automobiles. Dwellings to house the mechanics employed will be erected.

The Dayton Engineering Laboratories Company, Dayton, O., maker of Delco electric starting, lighting and ignition systems, reports that for the year 1915 its products will total about 125,000. During September, 14,515 complete systems were produced, which established a

record for Delco. The factory is still behind its schedule, and to provide more facilities for increased production the company is building a five-story addition to its factory, measuring 420 by 88 feet, which will double the present floor space.

The Hupp Motor Car Company, Detroit, recently turned the vacant area in the rear of its factories into a playground for the benefit of the children of its employees and those of employees of several other motor vehicle and parts makers in the vicinity. As a result, as a Chicago newspaper pointed out in an editorial upon the subject, street accidents in that neighborhood have fallen off 70 per cent. No statistics regarding the diminution of juvenile misdemeanors exists, but a decided change for the better is apparent.

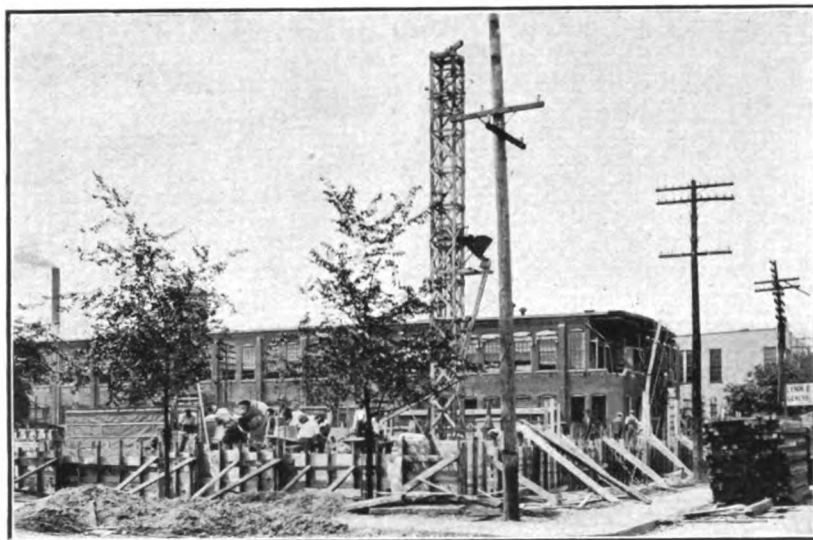
The F. B. Stearns Company, Cleveland, manufacturer of the Stearns-Knight cars, adopted Oct. 16 a weekly work schedule of 48 hours for its 1000 employees. The men receive pay for 55 hours and at the rate of time

and a half for each hour over 48. The night shift is paid straight time and a half. The company gives its reasons in these phrases: Popularity increased the demand; demand increased the production; increased production lowered the cost; the lowered cost reduced the selling price; the reduced selling price increased popularity, demand and production.

The Studebaker Corporation broke its production record for a single day on Friday, Oct. 15, by turning out 347 cars. Inasmuch as this was done without extra effort, the officials are confident that its organization can maintain the pace and even exceed it when necessary. Indications are now that October will prove a banner month for Studebaker, and its representatives in every part of the country are reporting that fall business in various lines is running far ahead of what was done last spring.

The Puritan Machine Company, Detroit, has bought the stock of parts, jigs, templates, blue prints, etc., used by the Havers Motor Car Company of Port Huron, Mich. These were moved to Detroit, from where owners will be served promptly and cheaply.

The Colby Motor Company, Mason City, Ia., adjudicated a bankrupt, has had 204 claims, aggregating \$1,250,000, and ranging from \$10 to \$274,000 in individual amounts, filed against it. It is expected that more than a month will be taken up in presenting claims, and that a number will be contested.



Corner View of One of Two Buildings Being Erected for the National Motor Vehicle Company.

The National Motor Vehicle Company, Detroit, is producing cars at the rate of 6000 a month, which provides enough for contract requirements and leaves a small surplus for dealers who underestimated their demands.

The Pullman Motor Car Company, York, Penn., has leased the entire third floor of the W. L. Small building and the lot in the rear, both of which are opposite the Pullman plant. This provides 10,000 square feet of additional space.

The Denby Motor Truck Company, Detroit, is to use Disco electrical equipment hereafter.

The Dust Proof Manufacturing Company, Frost Proof, Fla., has been organized and is being incorporated with capital of \$20,000, half of which has been paid in. The company is to manufacture and sell a dust proof automobile polish which gives promise of being one of the fastest selling products of its kind on the market. The makers declare it to be better than any polish, wash or wax now being sold.

The Chevrolet Motor Company of New York recently acquired the easterly block front on Eleventh avenue, between Fifty-fifth and Fifty-sixth streets, New York City, for improvement in connection with the company's large plant occupying the block front directly to the north. With improvements this will afford the company the entire Eleventh avenue frontage between Fifty-fifth and Fifty-seventh streets.

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EXPORTS TO NEUTRAL COUNTRIES.

WHILE the July report of automobile exports from the United States shows continued large shipments to the countries at war, the more interesting fact is that there has been a large increase in exports to neutral countries.

This, of course, is an effect of the war, since it means that American cars are purchased in place of those formerly secured in Europe, where the plants have been turned over to the production of munitions.

As compared with July of last year, South American countries this year took 315 cars in July, valued at \$197,292, as compared to 90 cars, valued at \$62,288 last year. During the seven months' period ending in July, 1914, they took 872 cars, valued at \$709,239, while this year they took 1212 cars, valued at \$643,718.

It will be noted that this last comparison shows a large increase in the number of cars, but a decrease in value. Business has been bad in South America for several years and economy is being enforced there. It is predicted that large numbers of low priced American machines will replace the small number of high priced European machines which have previously been used. South America has been affected as has the United States by an increase in the price of horses, due to the war.

Total exports for the month were 2469 commercial vehicles, valued at \$6,803,001, as compared to 50 last year, valued at \$106,400. Passenger cars numbered 4118, valued at \$3,835,347, as compared to 1265, valued at \$1,143,419. Total exports amounted to \$10,638,348 for the month, as compared with \$1,249,819 last year.

The figures show that the amount of exported motor cars has increased rapidly as the war goes on instead of decreasing. It seems to show that the European armies have found American trucks fully equal to the European product and that they have adopted a policy largely of buying American trucks for the use of their armies, while they have at the same time converted their own truck factories into munitions plans.

During the early months of the war the truck exports greatly exceeded those of previous years, while the passenger car exports ran behind. The passenger car exports are now three or four times greater as well.

Recently, however, both England and France have adopted heavy tariffs against American passenger cars and the effect of these, which will

undoubtedly be to cut down exports, will be shown in the October, or at the latest, the November reports.

EUROPE WANTS AMERICAN CARS.

That America will soon have the entire passenger car trade of England and the continent, notwithstanding tariffs, is the belief of Mr. De Lorenzi of the Maxwell Motor Company of London, England, who has been visiting the factory at Detroit to secure an enlargement of the allotment of cars for his company. British manufacturers are all engaged on war work, all the good mechanics are monopolized by those with gov-



Shipments of Automobiles to South America Show Great Increase.

ernment contracts and labor costs have gone up 100 per cent., so that it is entirely impossible for them to compete with American manufacturers. One of the great difficulties he has found has been to secure steamer space for the shipment of his cars, as nearly all the boats are under charter for carrying munitions.

HUPMOBILES IN PHILIPPINES.

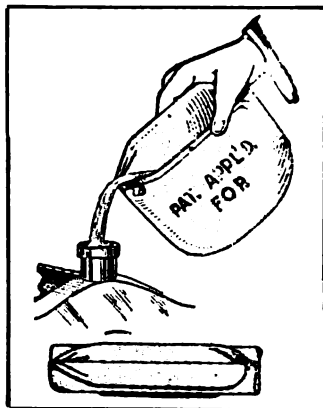
Automobile registration for the Philippine Islands up to June 30, 1915, show that there are more Hupmobiles in the islands than any other two makes and nearly twice as many as any other make, including the well known popular priced cars. The figures show that there are 488 Hupmobiles, 247 of the next highest make and 228 of the third make. Hupmobiles have led in Philippine registration for the past 2½ years.

CAR ACCESSORIES AND EQUIPMENT.

HAYES FOLDING WATER BUCKET.

Folding Bucket Which Can Be Carried in the Car and Affords a Practical Means of Conveying Water.

The F. C. Hayes Company, Altamont, N. Y., is the manufacturer of the Hayes folding water bucket, shown in the accompanying illustration. It is water proof canvas made of heavy brown and has a capacity of over a gallon and will carry water for any distance. When folded the bucket measures $3\frac{1}{2} \times 10\frac{1}{2}$ inches, and can be conveniently carried under the seat or in the door pocket. The metal parts are warranted to be absolutely rust proof. An advantage of this bucket is that it can be used as a fish or game bag by fastening a strap or small rope through the loops in the side. The bucket retails at 75 cents each. A special discount is given to the trade. Inquirers mentioning this magazine when writing to the manufacturer regarding this accessory will receive prompt reply.



Hayes Folding Water Bucket.

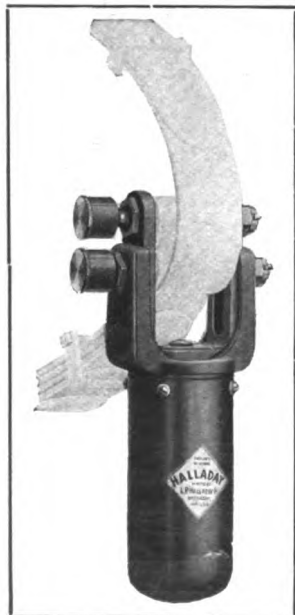
HALLADAY SHOCK ABSORBER.

Frictionless Device Requires No Lubrication and Has No Wearing Parts.

A frictionless shock absorber is being sold by the L. P. Halladay Company, Streator, Ill., manufacturer of many high-grade automobile accessories. These are designed for all makes of cars that are equipped with three-quarter or full elliptic springs. The manufacturers warrant them against defects and guarantee them for long service, as the workmanship and material are of the best.

The complete absence of friction makes wearing parts or bearings unnecessary and no lubrication of any sort is required. They are said to be very effective in taking up shocks on a rough road and checking the disagreeable rebound which often follows a bad bump. The price at retail is \$9 per set. The accompanying illustration shows how the absorber is installed and also shows their general neat appearance.

The company will supply full information regarding this absorber, as well as its large variety of other high quality specialties, to inquirers who mention this publication when writing as the magazine in which they read a description of the article.



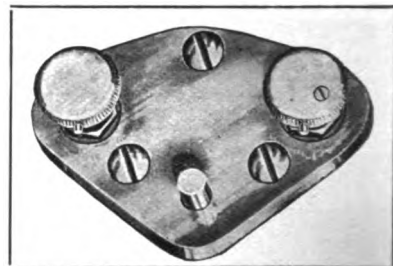
Halladay Shock Absorber.

PREST-O-LITER.

It Makes It Possible to Control Acetylene Lamps from the Seat and Lights, Dims and Extinguishes.

The Prest-O-Lite Company, Inc., Indianapolis, Ind., well known for its production of dissolved acetylene, is manufacturing a lighting system which permits the driver to control the acetylene lights without moving from the seat. It is known as the Prest-O-Liter and consists of insulated burner tips in the lamps, and a small vibrator coil, which is connected by simple wiring and operated by a single push button. The necessary current is supplied from the ignition battery, or special dry cells can be used. The arrangement is such that the lights are lit by the turn of a little valve and the press of a button. The lights can be dimmed or extinguished as desired.

The accompanying illustration shows the style No. 3 dash controller. One valve controls the headlights, while the other operates the tail lamp. By pushing the button at the top, all lamps can be lit simultaneously or separately. To dim the headlights with this controller it is only necessary to turn the valve to a notch provided for that purpose. An automatic reducing valve forms part of each Prest-O-Liter outfit. This attaches to the tank and regulates the pressure so that the flame in the lamps can never be too high. This valve maintains an even pressure in the pipe lines regardless of the number of lamps burning or the amount of gas in the tank. This system has the advantage that should the electric current fall through loose connections, etc., it is a simple matter to light the lamps with a match. The style No. 3 equipment retails at \$16. Further information concerning this and other outfits can be obtained upon request when this journal is mentioned.



Prest-O-Lite.

OUTLOOK CLEANER.

It Removes Sleet, Rain and Fog from the Windshield by an Adjustable Wiper.

Rain, fog and mist adhering to the windshield obstruct the vision of the operator and makes driving dangerous. To overcome this, the Outlook Company, 5518 Euclid avenue, Cleveland, O., is manufacturing the windshield cleaner shown in the accompanying illustration. It is a simple and inexpensive device, which is designed to fit any windshield. It has an adjustable wiper and cleans the front of the windshield without the driver leaving the seat.

The attachment is finished in black or nickel and weighs about 10 ounces. The retail price is \$1.50. Those readers interested should write to the company for further information and should mention this magazine in their letters, as the publication in which they first read of the Outlook windshield cleaner.

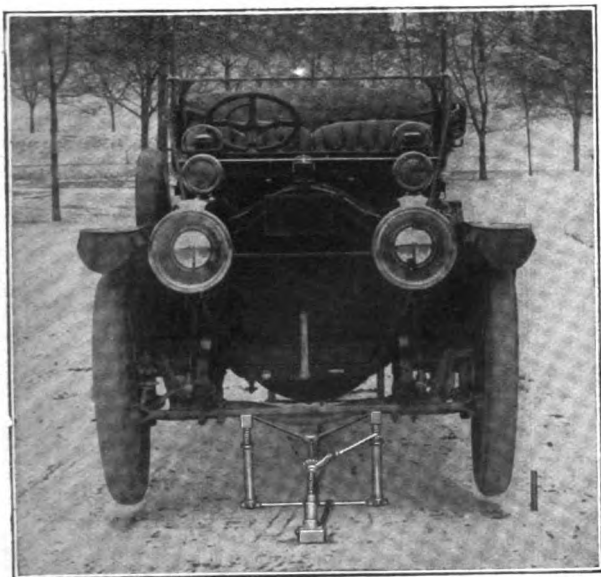


The Outlook Cleaner.

FOUR-WHEEL AUTO JACK.

It Raises the Four Wheels Simultaneously and Holds Axles in Vise Like Grip—Car Cannot Tilt.

The four-wheel auto jack, marketed by the Reading Automobile Company, 126-128 N. Fifth street, Reading, Penn., is designed to lift and block all four wheels of any weight car in 30 seconds. This equipment, which is illustrated herewith, is especially adapted to garage and repair shop service. It consists of two steel frames with adjustable uprights, which are held rigid by heavy steel cross bars. The bases of the two frames are connected by 12 or more feet of specially tested chain. The frames are placed at an angle under the front and rear axles. A powerful differential screw then pushes the car backward a few inches, resulting in the frames standing in an upright position. This arrangement elevates the rear and front of the car at the same time. Some of the work which this device is designed to facilitate are, releasing weight from tires, washing car, examining the steering gear, testing the brakes, attaching skid chains and for testing the clutch, transmission or differential. The jack affords a vise like grip on the axles, and it is



The Four-Wheel Auto Jack in Operation.

impossible for the car to tilt or chains collapse. The device retails complete at \$20.

KELLOGG AIR PUMP.

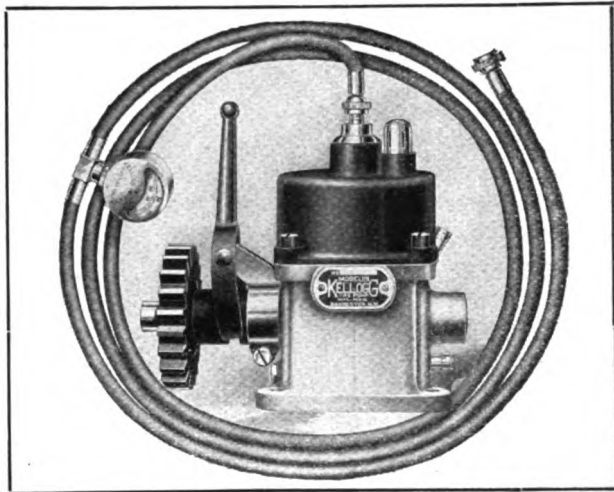
Kellogg Manufacturing Company to Continue Producing the Present Model Engine Driven Air Pumps.

The Kellogg Manufacturing Company, Rochester, N. Y., announces that it will continue the original design of its different models of engine driven tire pumps for the coming year, which have proven very successful because of their many high-grade features.

The accompanying illustrations shows the construction and compactness of the device. The cylinder is made of close grained gray iron, and three carefully ground steel rings are fitted to the piston. Air is admitted through a poppet valve in the cylinder head.

The new pumps use babbitt bearings instead of the bronze as in former models. The lubricating system is so designed that an absolute guarantee is given with each equipment that oil cannot be forced with the air into the tire. Attachment to any machine is made simple through the co-operation of several engineers in the designing of the fittings for the various makes and models of cars. Complete instructions with drawings also tend to simplify installation. The Kellogg pump

complete with rubber tubing, gauge and all necessary fittings retails at \$15. Special models are also made for



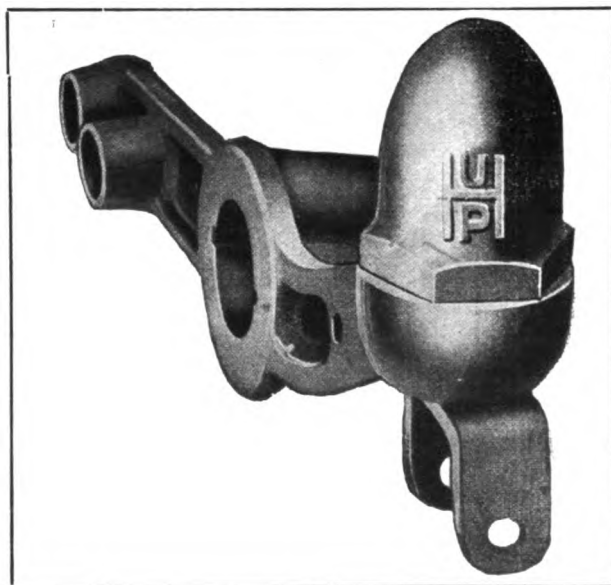
Kellogg Air Pump.

the Dodge, Chevrolet and Maxwell cars and are listed at \$10, while a Ford model sells at \$9.50.

HUP SHOCK ABSORBER.

Shock Absorber Designed Exclusively for the Hupp Model 32, Prevents Shocks by Using Helical Spring.

The Hup shock absorber, manufactured by the Miller & McLean Company, 120 Liberty street, New York City, and illustrated herewith, is designed especially for use on the Model 32 Hupp. The action is controlled by a strong helical spring. It is declared that when a spring of this type is properly used in conjunction with the ordinary spring, smooth riding can be obtained under most conditions of speed or roadway. The absorber does not



Hup Shock Absorber.

increase the strain on the axle, but tends to decrease it by doubling the efficiency of the springs. It can be attached by the owner in a very few minutes, the only tool required being an ordinary wrench. The Hup shock absorber retails at \$10.

PRACTICAL FACTS FOR NEW CAR OWNERS.

Elementary Instructions in the Economical Operation, Maintenance, Adjustment and Repair of the New Car—Answers to Inquiries.

ALTHOUGH every part of an automobile may be in perfect condition, the full efficiency of the motor cannot be obtained unless the functioning of the ignition system and the valves is in perfect synchronization with the strokes of the piston.

A result of a motor not being timed correctly is that the spark takes place prematurely, that is, while the piston is coming up on the compression stroke and before it has reached dead centre and is about to return on the power stroke. In this instance the pressure from the ignited charge

that can be accomplished by almost anyone.

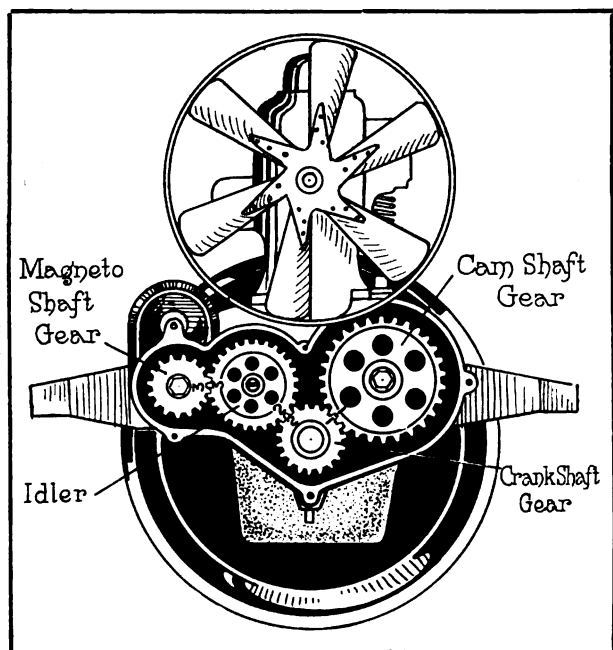
The engine used generally in present day automobile construction is the four-cycle type, which means that the piston must make two downward and two upward strokes in its cylinder before its full quota of power is contributed to propelling the car. These strokes are known sequentially as follows: The intake, the compression, the power and the exhaust strokes.

At the beginning of the first of these strokes, the intake valve, if it is correctly timed, will open to admit gas to the combustion chamber, which is drawn in by the suction created by the passage of the piston. At the end of the downward stroke the inlet valve closes and makes the cylinder air tight. As the piston comes up on the second, the compression stroke, the gas is compressed. At the apex of the stroke, the spark takes place and ignites the tightly compressed gas. The expansion caused by combustion results in pressure that forces the piston on its downward stroke.

The principle of this is that pressure will follow the lines of least resistance, and in the gasoline engine cylinder the piston offers the least resistance after it has completed the second stroke. When the piston has reached the lowest point of this, the power stroke, the exhaust valve, if accurately timed, will open so that the burned gas can be expelled into the exhaust manifold during the upward stroke of the piston. This stroke completes the cycle.

Though it is impossible to set an arbitrary rule for timing motors, because all engines are not timed alike, the principle of each does not vary so very greatly but what the following will not apply in general.

The components first requiring attention are the intake and exhaust valves. In the L head type of motor these valves are all situated on one side of the block and require but one camshaft for operation. These cams are so arranged that the valves open and close during one revolution of the camshaft. But inasmuch as each piston must complete its four cycles, it is necessary that the crankshaft revolves twice as fast as the camshaft. This is made possible by reducing the ra-



Timing Gears on Modern Cars Are Marked, as Shown Above, and Insure Perfect Synchronization.

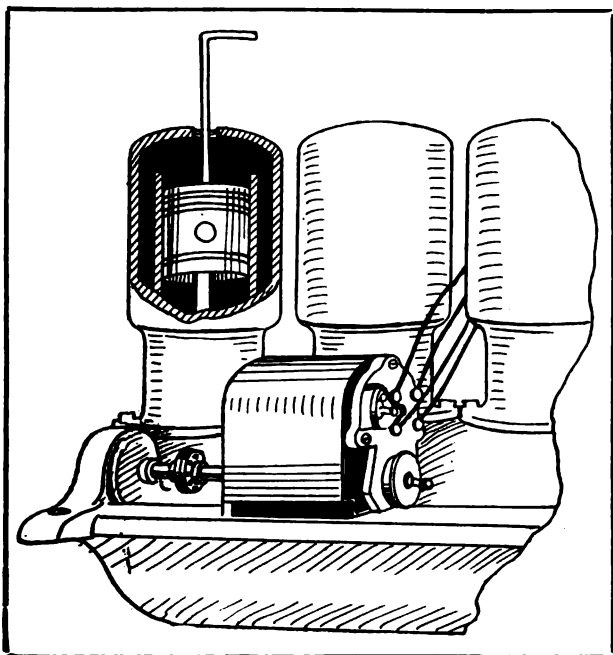
pushes against the upcoming piston, and if it were not for the momentum of the heavy flywheel the movement of the piston and the crankshaft would be reversed. As it is, there results a tremendous strain on the bearings and shaft. The connecting rods frequently will give way under the strain, particularly if flaws exist in the metal.

An indication of trouble with timing is the pounding sound that comes from the motor during operation. This trouble should be remedied immediately. It is a simple operation and one

tion of speed by using a gear on the camshaft that has twice as many teeth as the gear on the crankshaft.

To time the valves, which is a comparatively simple matter, determine the top centre of the piston in the cylinder nearest the front of the motor. On late models this point is marked on the flywheel, and it is a simple matter to obtain accurate register. If the flywheel is not marked, the operation is slightly more difficult.

The dead centre of the pistons of most four-cylinder motors is obtained when the pistons of the first and fourth or second and third cylinders are at their highest point of travel. This can be ascertained by inserting a piece of wire through an opening in the cylinder head until it contacts with the top of the piston. The motor



Relative Location of Piston and Distributor Sector in Timing the Magneto.

should then be turned over by hand until the piston of No. 1 cylinder is almost at the top of its compression stroke. Now turn the motor over very slowly and carefully until the piston is exactly at the top. This will be denoted by the movement of the wire. It should be at a point where it is neither rising or lowering. This is the dead top centre and at this point the top of the flywheel should be indelibly marked.

The lower centre is diametrically opposite. The timing of the valves is now a simple matter, depending, of course, on the design of the motor. The timing diagram of a large engine not of high speed type is shown in Fig. A. It will be noted that the intake valve opens at five degrees past top centre and closes at 15 degrees past bottom centre. On the next revolution of

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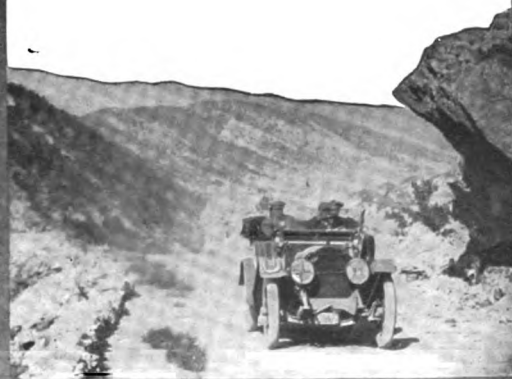
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the crankshaft the exhaust opens at 30 degrees before bottom centre and closes at top dead centre.

This timing is not to be considered as a standard. The design and high speed of operation of different motors causes this to be varied. It will be well to remember that the desired timing cannot always be obtained by changing the position of the cam, as this would alter the timing of another valve. This condition is remedied by lengthening the pushrod so as to engage the valve earlier and close it later. By shortening it the valve is opened later and closed earlier. It is imperative, however, that when the valve is closed there must be a space about the thickness of a name card between the push rod and the valve stem.

Fig. B illustrates the timing diagram of a well known eight-cylinder motor. As in the four-

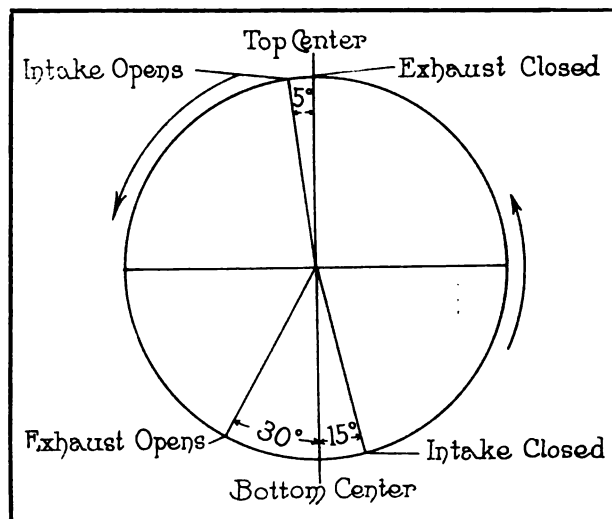


Fig. A—Timing Diagram of a Medium Speed Large Motor.

cylinder type, each cylinder requires four cycles to complete its work. It is obvious that there must be four power strokes to each revolution of the crankshaft, as compared with three on the six-cylinder type, and two on the four-cylinder models.

Consider piston No. 1 on upper dead centre and about to begin the power stroke. After the piston has travelled $2\frac{25}{32}$ inches in the downward direction, the crankshaft has turned 90 degrees and at this point, piston No. 8 commences its power stroke. It will be noted, however, that when combustion takes place in cylinder No. 8, No. 1 piston has not fully completed its power stroke, having still 45 degrees to travel. The overlap of one explosion with another, however, affords an even torque, there being a continuous

production of power instead of a short lapse between explosions.

Valve timing is usually tedious work, as frequently the mesh of the cam and crankshaft gears must be changed several times before the correct relationship of the cam to the valve is found. On modern cars the correct relationship is marked and the gears should always be meshed at this point. If no marks are visible, the two gears can be marked at any one meshing point when the workman is absolutely sure that the timing is correct.

Timing the ignition means the firing and expansion of the charge of compressed gas, and not the mere occurrence of the spark. There is a difference between the time at which the electric spark jumps across the gap in the spark plug

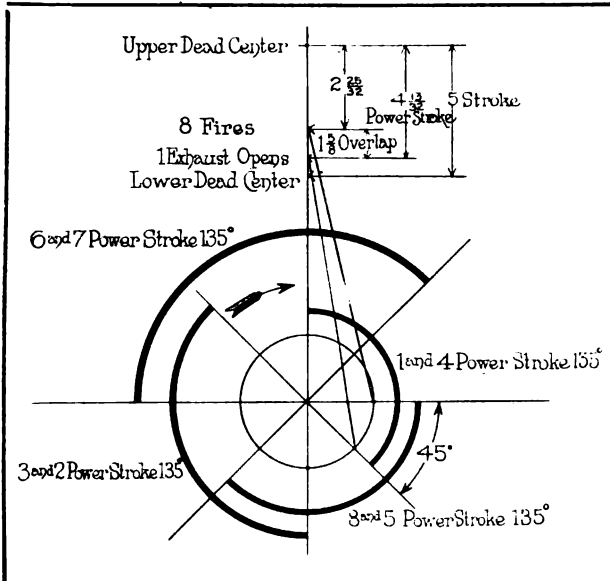


Fig. B—Timing Diagram of the King Eight-Cylinder Motor.

and the time at which the gas starts to expand. There is also an interval between the time of breaking contact at the timer and the ignition of the gas. This is what is commonly termed the lag.

To offset this at different engine speeds the commutator is advanced proportionally. This advance is necessary whether it be a battery or magneto system. The intervals vary according to the number of revolutions made by the crankshaft and practise alone can teach the operator the proper advance necessary. The advancement also differs according to the design of the motor, amount of compression, condition of coil, etc.

As when setting valves, there are several methods of timing the ignition. The simplest is to turn the engine over by hand until the piston

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of No. 1 cylinder is at the top of the compression stroke, as previously described. Now turn the engine over a trifle more until the piece of wire descends a half inch. The spark lever is then fully retarded backwards or forwards as the case may be. This is the point at which the spark should occur.

Although this may appear late, this arrangement is necessary if the safety of the operator is to be insured. It is obvious that when cranking the motor by hand the flywheel has not attained sufficient momentum to prevent driving the piston in a reverse direction. As a matter of safety the spark is set to occur when the piston has passed the top centre. When the motor is operating on its own power the lateness is easily remedied by advancing the spark lever.

If the spark does not occur when the piston is at the point stated, the commutator roll should be loosened and moved forward until it just registers with the contact point provided for that cylinder. To time a magneto, assuming that it has not been disassembled, it will only be necessary to break the driving joint and turn the shaft until the bronze sector in the distributor registers with the contact point, furnishing the current for the cylinder. The connection to the engine should then be made with the points in the described position.

When overhauling the motor determine before disassembling that the gears utilized to drive the magneto are marked. The best method of marking is to prick one gear on the end of the tooth and the other gear against the space in which it enters. Make sure that there is no lost motion in the spark lever, as this will often baffle the workman when timing.

READERS' QUERIES.

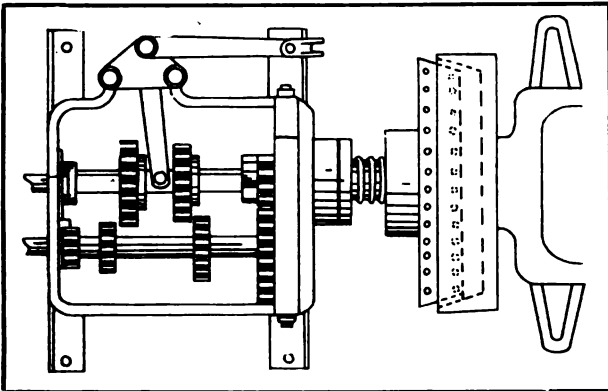
Changing Sliding Gears, How Brake Horsepower is Reckoned, Suggestions as How to Turn Stubborn Nuts, Practical Method of Locating Ignition Troubles.

Changing Sliding Gears—H. B., Egg Harbor, N. J.

Why is it that the different speeds of a sliding gear transmission cannot be changed when the clutch is engaged? What effect does the clutch have on the transmission?

There are two principal shafts in a sliding gear transmission, known as the main and sub or counter shafts. One of these shafts has sliding gears that are controlled by a lever and these gears are so arranged as to mesh with those per-

manently located on the other shaft. If you attempt to mesh the sliding gears with the gears on the other shaft without first disengaging the clutch, the effect would be to bring together two gears which are rotating at different speeds. The ends of the teeth would meet and some of them may be broken on both gears, an action usually termed stripping the gears. To prevent this a medium is placed between the engine and the shaft bearing the permanent gears. This medium is termed the clutch, the most popular types of which are the multiple disc and the cone. The action is shown in the accompanying illustration. When the clutch is disengaged, all connection with the engine is broken and the shaft ceases to rotate. The shaft holding the sliding gears, however, has a direct connection with the drive shaft and continues to rotate at the speed the car is travelling. A change of gears to a proper ratio will not, however, effect the gears,



Components of the Progressive Sliding Gear Transmission.

although extreme changes such as from high to low are not advised until the car has reduced to a speed that which corresponds to that gear.

Brake Horsepower—W. B., Mercer, Penn.

Can you explain the exact meaning of brake horsepower and how is it calculated? Are the number of revolutions taken into consideration?

The general method of obtaining the horsepower of a motor is to subject it to the brake horsepower test. The number of revolutions made by the flywheel must be taken into consideration, as the power of efficiency increases with the rate of motion. The Prony brake shown in the accompanying illustration affords an efficient means of testing the effective power of a motor. It consists of a strip of sheet metal to which is attached a number of wooden blocks having shoulders at the sides to prevent it from slipping off the flywheel. These are applied to the circumference of the wheel and the brake

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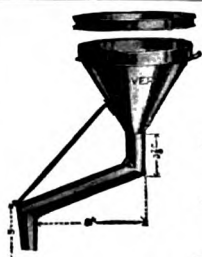
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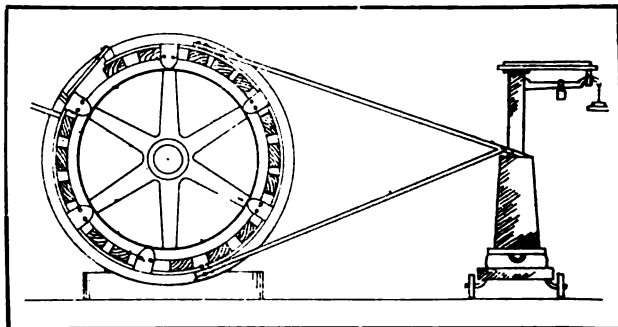
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drawn tight so that the blocks bear against the surface all around. This contrivance is prevented from rotating with the flywheel by two arms attached near the top and bottom centres of the wheel. These arms join at the opposite ends and form a lever which bears on an ordinary platform scale. If the platform is not directly in line with the centre of the shaft, a suitable block should be placed on the platform until the alignment is attained. It is obvious that the amount of friction between the wooden blocks and the revolving flywheel is weighed upon the scales.

However, this is not the correct brake horsepower, as the following factors must be taken into consideration: The circumference of the wheel, the length of the leverage, which is measured by a straight line drawn from the centre of the flywheel shaft to the centre of the scale platform, the number of revolutions per minute, the weight in pounds registered by the scale less the static weight of the brake lever arms and block



The Prony Brake Horsepower Testing Equipment.

which rests on the scale platform. Thus the formula for obtaining horsepower when this arrangement is used is as follows:

$$\frac{W \times N \times L \times C}{33,000} = \text{B. H. P.}$$

W represents the net weight indicated by the scale; N, the number of revolutions per minute; L, the length of the leverage, and C, the circumference of the flywheel. Their product gives the number of foot pounds developed, which when divided by 33,000 is the correct brake horsepower.

WEIGHT OF WATER VS. FUEL.

The weight of a gallon of pure water at 62 degrees Fahrenheit is rated at the standard figure of 8.3356 pounds. As all water is not pure, however, the weight usually adopted is 8.33 pounds. The weight of gasoline, roughly calculated, is about seven pounds, and kerosene 7.9 pounds.

The former is about 16 and the latter about five per cent. lighter than water.

OIL TEST.

A simple way to test oil is to saturate a piece of cotton string and then wrap it around a polished shaft. This should be exposed to the rays of the sun for about eight hours. If the metal is slightly corroded when the string is removed, some acid still remains in the oil.

TURNING STUBBORN NUTS.

Nuts and bolts that have been exposed to the atmosphere for some time are frequently difficult to remove. If an even pressure can be applied to the nut it will often turn even though set tightly. Fig. A illustrates the position of the wrenches as applied to the nut or bolt. A small monkey wrench is set snugly on one part of the nut and

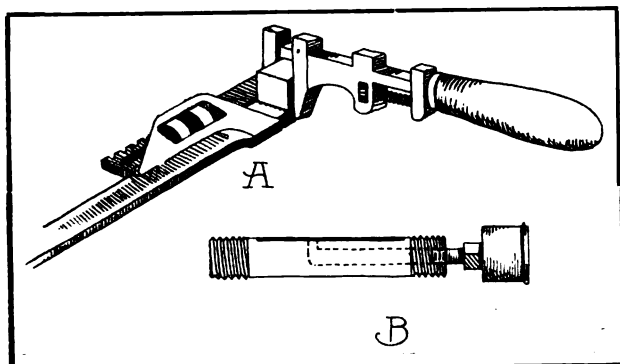


Fig. A, How to Turn a Stubborn Nut; B, a Lubricator for Spring Bolts.

a larger Stilson wrench placed at right angles to it. When pressure is applied the leverage produced is tremendous.

HARDENED BUSHINGS FOR SPRINGS.

On many commercial vehicles and heavy touring cars the shackles and bolts are subject to heavy strains. The tendency is gradually to wear the holes oval in the spring and bracket. A simple repair for this is to remove the brass bushing, and if there is sufficient stock, machine the holes round and insert case hardened bushings. Case hardened bolts should be used. Before hardening, however, a hole should be drilled through the bolt and another through the surface, the two meeting. The longitudinal hole should then be tapped to take a small grease cup and a groove cut on the surface of the bolt for the distributing of the lubricant. This is shown in Fig. B.

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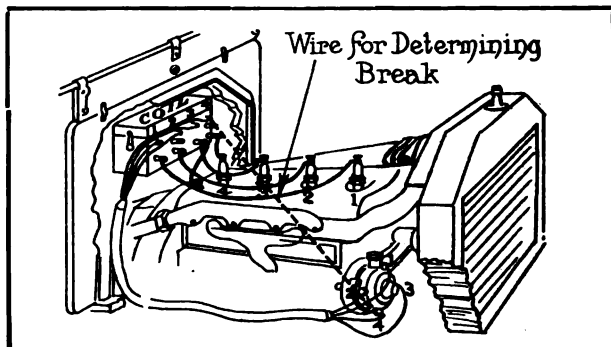
J. H. Sager Line.

SEARCHING FOR IGNITION TROUBLE.

Electrical troubles are usually manifested by irregular operation of the engine, lack of power, or sudden stoppage of the motor. While these symptoms may apply to other parts, it is more than likely that the ignition is at fault. If the trouble cannot be promptly ascertained, much time can be saved by making a systematic search of the electrical equipment. This is commonly termed in repair shops "the elimination process."

The source of the current should first be examined. If batteries are used, test each cell separately to determine that there is no weak or dead member. If the current depends wholly on a magneto, examine the breaker for pitted contact points. These may also be set too widely apart. Next search for loose or broken wires.

The spark plugs are next to be carefully examined. If there is a cylinder that misses and a



Locating Trouble in Ignition System.

spark plug is suspected, you can make certain by placing the plug of an operative cylinder in the cylinder that misses. Of course if the cylinder continues to miss, the plug is not at fault; but if the trouble is transferred to the cylinder in which the suspected plug has been placed, then the plug is defective and should be replaced.

If the missing cylinder is still inoperative, the trouble must be looked for elsewhere. Examine the distributor or commutator for weak springs and coated contacts. On many timers the contact roll is attached to the shaft by a set screw. This screw may work loose and allow the roll to change its relation with the shaft, at shown at A. It is obvious that this changes the timing of the motor.

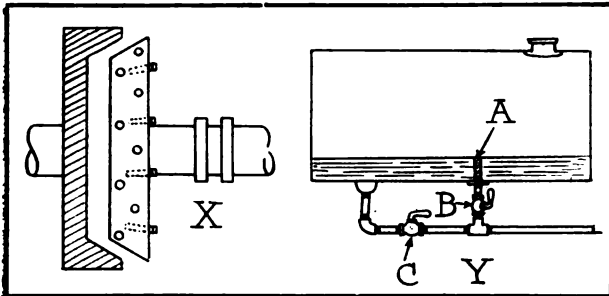
See that the insulation of all wiring is perfect. When a wire or set of wires is suspected as being faulty, a test can be made by substituting a temporary wire known to be in good order, as shown at B. If a vibrating coil is used, a sim-

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ple test of efficiency can be made by changing the positions of the units.

RESERVE SUPPLY OF GASOLINE.

It is a good plan to make provision for the carrying of an extra gallon of fuel so that it will be available for emergency purposes. There are several good methods often adapted, one of the best of which is illustrated herewith. A small piece of pipe of the same diameter as the gasoline line is inserted in the tank through a small hole cut at the bottom. The length allowed to stand upright in the tank of course depends on the amount of fuel to be reserved. The auxiliary pipe, A, is then attached to the main fuel supply by a globe valve, B. This valve remains open at all times, while the regular valve, C, is shut. The action is obvious. When the liquid has reached the level of the extended pipe, the supply ceases. This warns the operator that the fuel in the tank



X, How to Overcome the Slipping of a Clutch; Y, How to Always Be Certain of a Reserve Supply of Gasoline.

is low. He may continue for several miles, however, by opening the regular valve and thus drawing on the reserve supply. Of course, to construct a tank to meet the above requirements, the owner must be capable of neatly soldering the parts. Otherwise, it is advisable to have it done by a good tinsmith.

WATERPROOFING THE WINDSHIELD.

There are several inexpensive preparations made to apply to windshields so that water, mist, snow, etc., cannot adhere. A simple solution, however, which will serve the purpose well, is to make a paste of ordinary soap and water and smear a little over each side of the windshield. The solution can then be rubbed even with a little clean waste until only a fine film remains. If skillfully applied, the solution can be scarcely noticed when dry.

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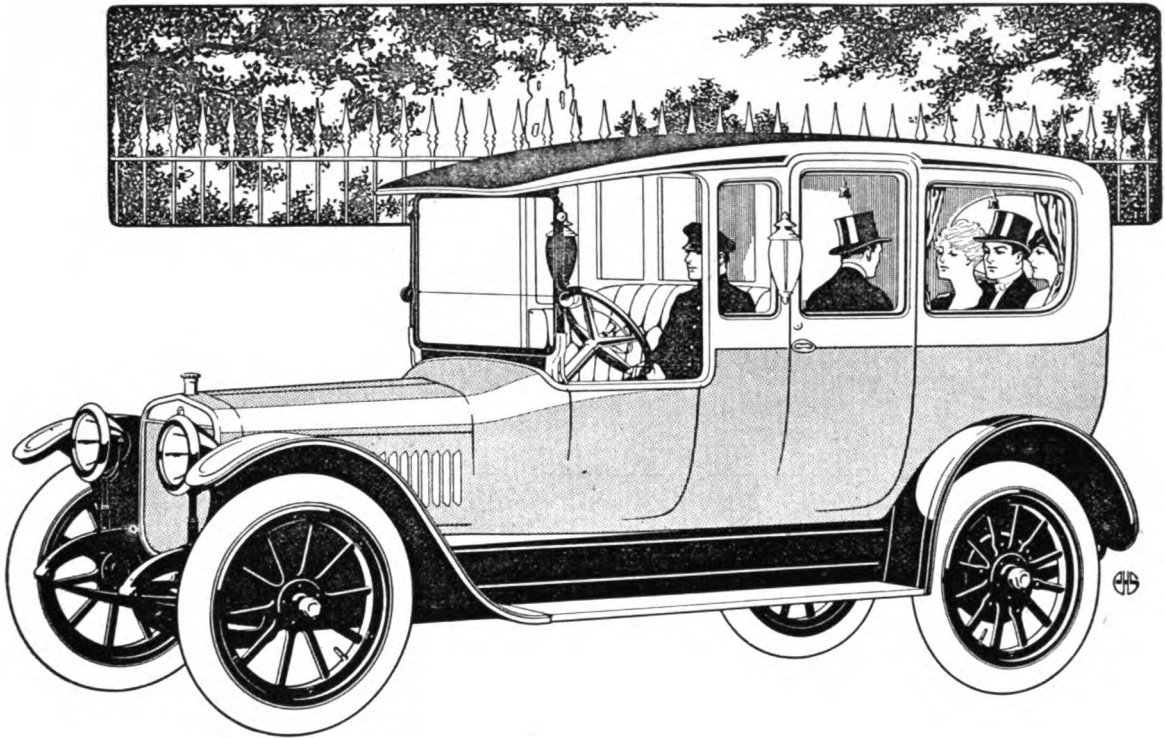
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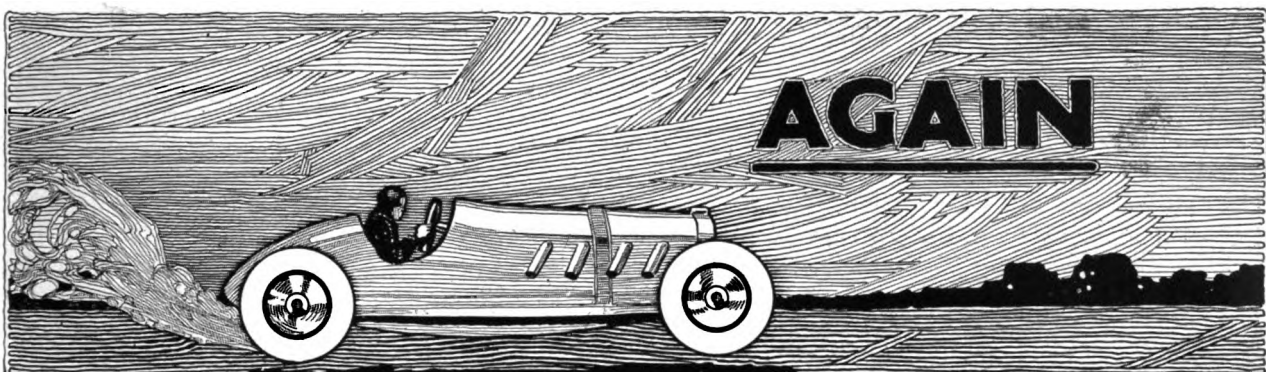
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—Bosch Magneto Ignition On All—

**Q There Was No D
Ignition Trouble**

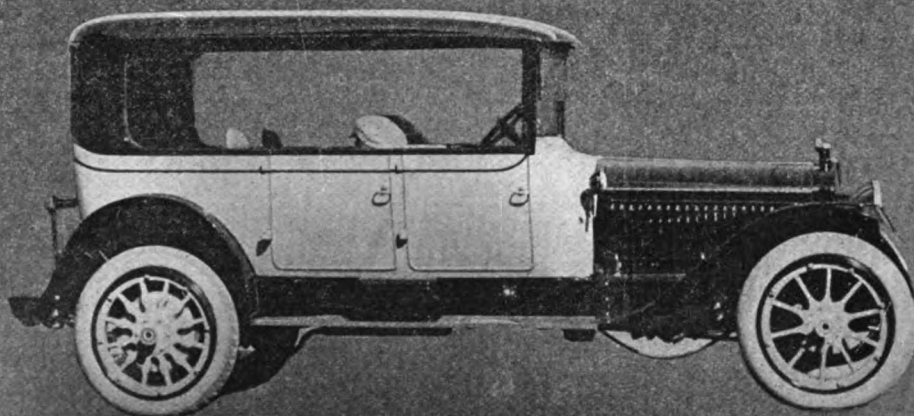
There is no difference of opinion among the close students of the motor car. They adopt Bosch Ignition, not only because Bosch is more speedy, not only because Bosch is more capable, but mainly because the Bosch Magneto is

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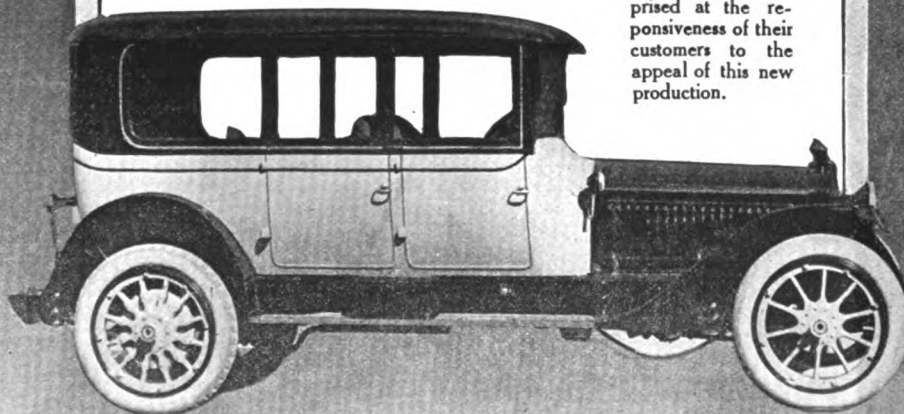
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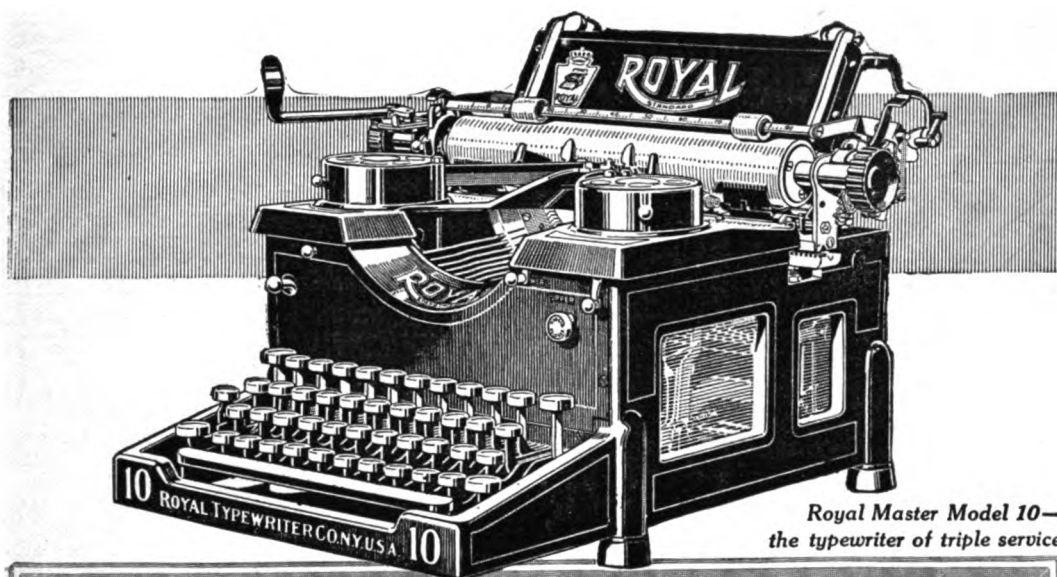
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Index to Advertisers.

	Page
Ahlberg Bearing Company.....	78
Barrett Manufacturing Co.....	77
Bosch Magneto Company.....	3
Boyd, F. Shirley.....	72
Coes Wrench Co.....	2
Culver-Stearns Mfg. Co.....	72
Dixon Crucible Co., Jos.....	75
Dover Stamping & Mfg. Co.....	76
Du Pont Fabrikoid Co.....	71
Eagle Oil and Supply Co.....	6
Elsemann Magneto Co.....	77
Glass and Novelties Co.....	6
Harris Oil Co., A. W.....	78
Hartford Machine Screw Co.....	75
Hartford Suspension Co.....	73
Heinze Electric Co.....	74
Inter-State Motor Co.....	74
King Motor Car Co.....	12
Mansfield Mfg. Corp.....	71
Marburg Bros.....	75
McQuay-Norris Mfg. Co.....	Cover
Mea Magneto Co.....	75
Mecca Mfg. and Spec. Co.....	6
Metz Company.....	72
Milwaukee Auto Spec. Co.....	73
New Departure Mfg. Co.....	74
Nordyke & Marmon Co.....	77
N. Y. & N. J. Lubricant Co.....	75
Peerless Motor Car Co.....	72
Pierce-Arrow Motor Car Co.....	Cover
Providence Automobile Show.....	70
Royal Typewriter Co.....	5
Scripps-Booth Co., The.....	69
Splitdorf Electrical Co.....	76
Springfield Metal Body Co.....	4
Standard Oil Co., The.....	7
Staybestos Mfg. Co., The.....	79
Superior Mfg. Co., The.....	76
Texas Oil Company.....	77
Thermoid Rubber Co.....	74
Times Square Automobile Co.....	6
Vacuum Oil Co.....	Cover
Valvoline Oil Company.....	77
Vanderpool Co., The.....	6
Wadsworth Mfg. Co.....	73
Weed Chain Tire Grip Co.....	73
Willys-Overland Co.....	Cover
Winton Co., The.....	1
Zenith Carb. Co.....	Cover

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RADIATORS.

Rome-Turney Radiator Co., Rome, N. Y. (Helical Tube.)

RADIATOR CEMENT. (See Cements.)**RADIATOR & HOOD COMBINATIONS.**

Superior Lamp Mfg. Co., 136 W. 52nd St., New York, N. Y.

REAMERS.

Harding Distributing Co., Boston. (Martell Aligning.)

REAR APRONS FOR FORDS.

Housel Sales Co., B Street, Buffalo, N. Y. (Gibmill.)

REBORING CYLINDERS.

Motorcycle Accessories Co., St. Paul, Minn.

RINGS. (See Piston Rings.)**ROAD BUILDING MATERIALS.**

Barrett Manufacturing Co., New York. (Tarvia.)

ROLLER BEARINGS.

Hyatt Roller Bearing Co., Detroit. (Hyatt.)

Norma Co. of America, 1790 Broadway, New York City. (Norma.)

SEATS.

Auto Parts Co., Dept. T, 737-739 W. Jackson Blvd., Chicago, Ill. (Racing.)

SELF-STARTERS. (See Motor Starters.)**SHOCK ABSORBERS AND SUPPLEMENTARY SPRINGS.**

Boyd, F. Shirley, 175 Massachusetts Ave., Boston. (Sager Peerless.)

Hartford Suspension Co., 147 Morgan St., Jersey City, N. J.

SPARK PLUGS AND IGNITERS.

Bosch Magneto Co., 223-225 W. 46th St., New York.

Faw, J. H., Inc., 41 Warren St., New York City. (Red Seal.)

Gibson-Hollister Mfg. Co., Boston, Mass.

Hartford Machine Screw Co., 512 Capitol Avenue, Hartford, Conn. (Master.)

Heinze Electric Co., Lowell, Mass.

Milwaukee Auto Specialty Co., 705-711 Chestnut St., Milwaukee, Wis. (Centerfire.)

Splittdorf Electrical Co., 98 Warren St., Newark, N. J.

Superior Motor Power Company, 24 Irving Place, New York City.

SPEEDOMETERS.

Standard Thermometer Co., Boston, Mass.

SPRING OILERS.

Housel Sales Co., B Street, Buffalo, N. Y.

SPRINGS FOR AUTOMOBILE SUSPENSION.

Marburg Bros., Inc., 1790 Broadway, New York. (Marburg-Hagen.)

Tuthill Spring Co., 756 Polk St., Chicago. (Titanic Unbreakable.)

SPROCKETS.

Boyd, F. Shirley, 175 Massachusetts Ave., Boston. (Baldwin.)

TEST CLIPS.

Mueller & Co., R. S., 431 High Ave., S. E., Cleveland, O. (Universal.)

THERMOS CASES.

Dover Stamping & Manufacturing Co., Cambridge, Mass.

TIMERS.

Motor Specialties Co., Waltham, Mass. (Bemus.)

TIRE CHAIN GRIPS. (See Chains.)**TIRES, CASINGS AND INNER TUBES.**

Federal Rubber Mfg. Co., Milwaukee, Wis. (Federal.)

Goodyear Tire & Rubber Co., Madison St., Akron, O.

TIRE TOOLS.

Housel Sales Co., B Street, Buffalo, N. Y.

TOPS AND ATTACHMENTS.

Highland Body Manufacturing Co., Station P, Cincinnati, O. (Highland Coupe.)

Springfield Metal Body Co., 20 Medford Ave., Springfield, Mass.

TRACTORS.

Knox Motor Associates, Springfield, Mass. (Knox.)

TRANSFORMERS.

Packard Electric Co., The, Warren, O.

TRUCKS AND TRACTORS. (See Cars, Commercial.)**VALVE GRINDING COMPOUND.**

Faw, J. H., Inc., 41 Warren St., New York City. (Eureka.)

VALVE TOOLS.

American Valve Tool Co., 589 Hudson St., New York, N. Y.

VIBRATORS.

J & B Mfg. Co., Pittsfield, Mass.

VULCANIZERS.

Mabey's Electric & Mfg. Co., Indianapolis (Mabey's Electric.)

Vanderpool Co., Springfield, O.

Williams Foundry & Machine Co., Akron, O.

WARNING SIGNALS.

Seiss Mfg. Co., 444 Dorr St., Toledo, O.

WELDING OUTFITS.

Dyer Apparatus Co., Cambridge, Mass. (Dyer.)

Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill. (Oxyacetylene Combination Outfit.)

Prest-O-Lite Co., Indianapolis, Ind.

Searchlight Co., 1012 Karpen Bldg., Chicago, Ill.

Waterhouse Welding Co., 3 Pelham St., Boston, Mass.

WRENCHES AND COMBINATION OUTFITS.

Coes Wrench Co., Worcester, Mass.

Faw, J. H., Inc., 41 Warren St., New York City. (Walden.)

Lane, Will B., 180 No. Dearborn St., Chicago. (Unique Ratchet.)

Mossberg Co., Frank, Attleboro, Mass.

Walden Mfg. Co., 73 Commercial St. Worcester, Mass.

NEW YORK

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BOSTON

DETROIT.

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VOL. XL.

NOVEMBER 10, 1915.

NO. 7.

PUBLISHER'S AND READERS' PAGE.

WINTER'S Cold Days Are Here, and consequently motorists are finding the usual difficulty in starting their engines and keeping their bodies warm. A great part of those difficulties can be overcome by the adaptation of a heating device, a large number of the best of which are described in the leading feature article of this issue. This article is another of those service stories which have been planned for The Automobile Journal, the motive being to give the subscribers the best possible information as relates to the operation and maintenance of motor cars. Each one of the heaters described has behind it the reputation of established business houses, and they all are very moderately priced as compared to the service they give. Naturally the manufacturers will welcome inquiries and will give full details of operation and installation to all who mention this magazine as the place in which they read about the device.

One of the Most Important Engineering discussions that has ever been prepared on the subject of multiple cylinder engines is that which Chief Engineer Crawford of the Cole Motor Company, delivered before the Society of Automobile Engineers. It appears in this issue of The Automobile Journal in full, and is accompanied by Mr. Crawford's accurate drawings to explain the details of the Cole Eight motor and to illustrate the points he makes in his analysis. Readers will recall that the Packard Twin-Six motor was described in a recent issue of this magazine and that early in the summer a complete analysis of the Cadillac Eight was given. These descriptions are authoritative, the work of the engineers responsible for the types of motors, and they form a library of information that is invaluable.

The Nov. 25 Issue will contain a complete review of the Providence Automobile Show, at which it is expected that there will be about 300 exhibits of pleasure and commercial cars and hundreds of accessories and equipment. The Dec. 25 issue will be the advance

number of the New York show, and among the many other features of interest to motorists will be an index to the exhibits, which will enable the visitor to quickly locate the particular exhibit in which he is interested. In addition there will be the usual preliminary data that belong to an advance show number.

The Publisher Directs the Attention of subscribers

to the Engineering Number of Motor Truck, the November issue, which will contain a large number of special articles pertaining to commercial cars that were prepared by the large majority of the makers of trucks and their components. The information given is not to be found in any other form, it being written especially for the Motor Truck. The discussions are not only of much value to those interested in commercial vehicles, but to owners of pleasure cars as well, for they cover subjects that are common to both types of vehicles. It is best not to depend on news stands to obtain this particular number, for the demand is certain to be great; the better plan to insure obtaining it is to write to this office and have a copy reserved.

A Frequent Complaint received by the Publisher is that the complainant has been unable to obtain copies of The Automobile Journal at news stands. This is regrettable, but is easily overcome by sending in a subscription, which will insure each copy being sent direct by mail. A certain proportion of each edition of the magazine is turned over to the national news companies for distribution to their agencies in all parts of the country, and it sometimes happens that an

agent is overlooked or is not given his full quota, or that the supply has been sold out. To avoid disappointment, subscriptions should be sent to the publication office, and each should be accompanied by check, draft, postoffice or express money order, or the amount sent by registered letter. When sending subscriptions be sure to write plainly the street and house number, or the number of the R. F. D. route.

Partial Table of Contents.

	Page
*Heating the Car for Winter Service.....	13
*Resta Wins Sheepshead Invitation Race	19
*General News of the Industry.....	21
*Providence Show to Be Big Event.....	25
Anti-Freezing Solutions for Winter Use	26
*Battery Rectifier of Wide Utility.....	28
*Two Jackson Eights and a Four.....	29
*New Cummins Monitor Cars.....	32
*The Characteristics of the Eight-Cylinder Engine	33
*The Improved Grant Six.....	42
*Motor Starting and Car Lighting.....	45
*Stutz Is Season's Champion.....	49
*Car Accessories and Equipment.....	53
*Industrial Happenings and Comment....	56
*Practical Motor Car Repairs.....	57
*Knox Tractor Hauls 41 Tons.....	60
*Suggestions for the Ford Car Owner....	61
*Ford Car Accessories and Equipment....	65
*Practical Facts for New Car Owners....	68

*Indicates article is illustrated.

Show Issues Automobile Journal

NEW YORK

Held December 31 to January 8

ADVANCE NUMBER

December 25 issue

REVIEW

January 10 issue

CHICAGO

Held January 22 to January 29

ADVANCE NUMBER

January 20 Issue

REVIEW

February 10 issue

BOSTON

Held March 4 to March 11

Display of Pleasure and Commercial Cars

ADVANCE NUMBER

February 28 Issue

REVIEW

March 10 Issue

Great Shows—Great Editions

Make Your Space Reservations

AUTOMOBILE JOURNAL

TIMES BUILDING

PAWTUCKET, R. I.



KING EIGHT \$1150

Improved Five-Passenger Model

(Motor Bore and Stroke, 2 $\frac{7}{8}$ x5)

IMMEDIATE DELIVERY

MORE power, numerous engine refinements, and finer body finish, make this car a superlative value. Only a greatly increased output permits the fixing of such a moderate price for a car of this quality. Thousands of these cars are now in successful operation the world over, and it was this model that made the famous official high gear tests on the Pacific Coast—two rough trips of over 800 miles each sealed in “high,” both with perfect scores.

Remember, there are *more* KING EIGHT-CYLINDER cars in operation than any other make except one. The KING is the pioneer popular-priced eight—one year ahead of all competition, and this Company possesses a knowledge of Eight-Cylinder construction which makers in our wake can learn only through experience.

The new KING color is Salon green. Body and hood of that color; with black radiator, fenders and running boards. Wheels, black with gold stripe. A ride in this car will mark a new epoch in your motoring experience and spoil you for other car types.

Place your order now. No waiting!

KING MOTOR CAR COMPANY, DETROIT, MICH.

DEALERS—The 1915 production of this Company is already double that of 1914, and this gain has been made on a new departure in automobile engineering—the successful EIGHT. At a price like \$1150, what will a car of the KING'S reputation mean to you in sales? There may be some open territory in your district. Wire!

(When Writing to Advertisers, Please Mention The Automobile Journal.)

THE AUTOMOBILE JOURNAL

VOL. XL, No. 6

NOVEMBER 10, 1915

Price, \$1.50 the Year

HEATING THE CAR FOR WINTER SERVICE.

Heating Devices for the Car, Radiator Mixtures and Devices to Keep Steering Wheel Warm Are Desirable Equipment for all Motorists.

THERE was a time not so very long ago in the history of the automobile when the coming of winter in the northern portions of the country meant the laying up of the great majority of the cars. But that is changed now and a large number of them every year are operated throughout the winter months. This year there will be more in use than ever before.

One reason why cars are now used the year round is that they have come to be necessities of every day life, rather than merely pleasure giving luxuries. They have increased greatly in dependability and power, and very deep snow is now required to make it difficult to operate them. Closed bodies have multiplied and this year the convertible body is making such headway that more closed cars than ever will be seen on the highways.

Experience has taught the industry how to reduce the discomforts of winter driving. The self-starter has made unnecessary the back breaking cranking that cold engines used to cause. Adequate radiator mixtures, with glycerine and alcohol in them, have been worked out to make

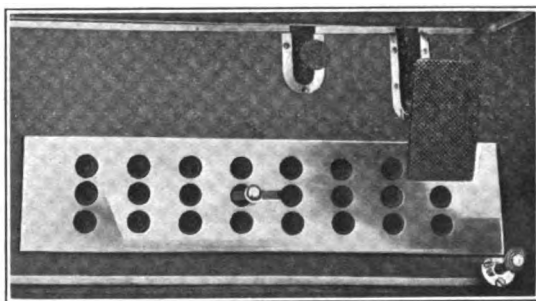
the freezing of the water supply unlikely. Carburetors have been made adjustable for cold starting. Blankets have been designed to keep the engine and radiator warm. And the accessory makers have successfully turned their ingenuity upon the problem of supplying devices that will keep the passenger and driver comfortable and remove many of the difficulties of starting the engine and steering the car.

Warming the Steering Wheel.

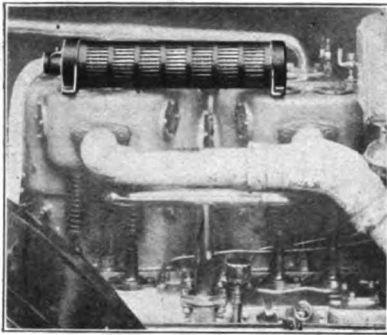
There are electrical devices which are laced on the steering wheel. They look like neat leather grips, but when connected with the storage battery, the magneto or generator, they keep the hands comfortably warm and free from stiffness even if very light gloves are worn. There are many types of heaters for both the driver's

and the rear passenger compartments. One of these is a simple radiator in the footboards, which admit to the front compartment or to the whole interior of a coupe or sedan the free heat that is always circulating about the top of the engine.

There are numerous foot rest heaters. Some of



The Foss-Hughes Heat Radiator Installed in Driver's Compartment.



Consolidated Car Heating Company's Engine Heater.

these draw their heat from the water circulating system, piping the hot water through a foot rest radiator in a manner which is exactly similar in principle to the hot water heating system for homes.

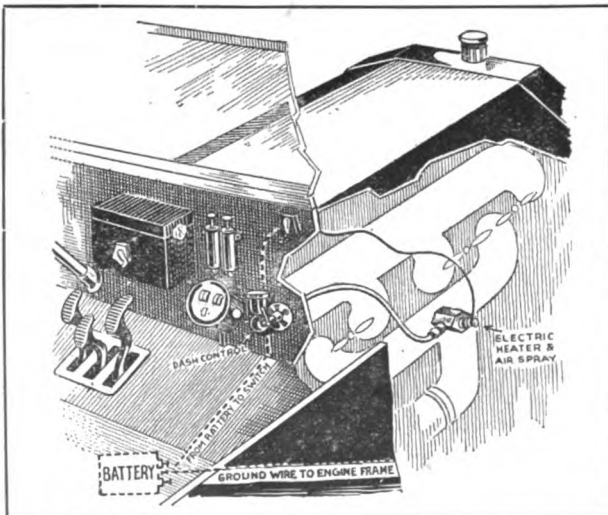
Other systems use the hot exhaust gasses in the same way. Some of these take the gas after it issues from the muffler and run it through the car. Others connect with the exhaust before it reaches the muffler and pipe a portion of it through the car.

Then there are numerous types of the old time heaters that were used in buggies and carriages—metal boxes in which slow burning coal is consumed without flame or gas. And some use hot bricks or other similar heating arrangements. There are electric radiators for the interior of the car, they drawing current from the starting and lighting system.

There are electric radiators that can be placed over the engine in a cold garage at night, a plug being connected with the electric lighting system to keep the engine always warm and ready for starting.

Devices That Kill Discomfort.

These devices properly fitted to a car are wonder workers in removing discomfort from winter motoring. They make the closed car as cosy



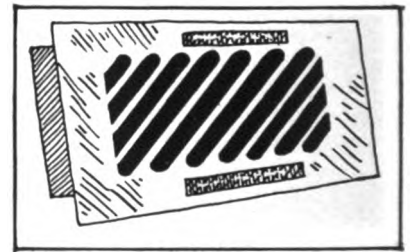
Interstate Ieco Electric Manifold Plug and Heater.

as the parlor. They take all the rigors out of the use of the ordinary open car; for with a heater under the robe, the passenger is cosily warmed where heat is most necessary.

One of the most novel and interesting of these heating devices is the Steer-Warm, manufactured by the Interstate Electric Company, 349 Baronne street, New Orleans. Steer-Warms are neat leather grips that are laced on the steering wheel and then wired up with the storage battery, or, in the case of the Ford car, connected with the magneto.

They require very little current. If operated on the correct voltage they are guaranteed for five years against burning out. When the current is turned on they grow gradually warmer until they have reached a certain heat and then maintain that temperature evenly.

They keep the hands comfortably warm in any temperature, even if only light gloves are worn. By keeping the hands warm they make the whole body comfortable, prevent stiffness, and the suffering from numbness that often makes driving dangerous. On delivery wagons they keep the drivers comfortable and efficient



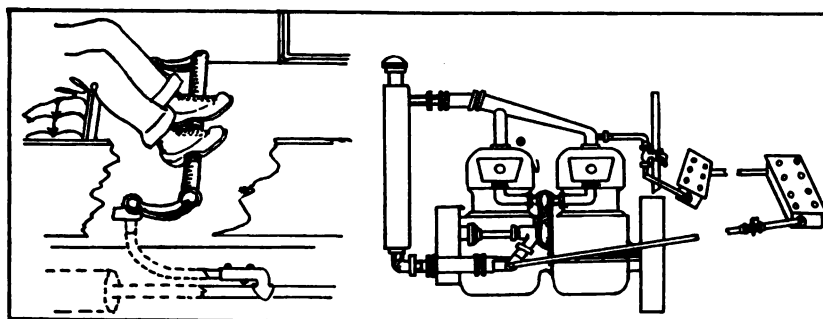
Reynolds Heater and Radiator.

and save a great deal of time in delivering packages. For this reason they have been adopted by many large department stores.

Another heating specialty produced also by the Interstate Electric Company is the Ieco manifold plug. This heats the gas and supplies a warm mixture to the motor, so that on cold mornings it can be started at once. It makes it possible to run on a much less rich mixture than is ordinarily used and so saves a great deal of gasoline. A line from the dash makes it possible to sit in the seat and prime the cylinders, which adds greatly to cold weather comfort.

Two Electric Heaters.

Two types of heaters are made by the Consolidated Car Heating Company, Singer Tower, New York City, one for passengers and one for the engine. The passenger heater is an electric device which is designed for operation on high voltage in the case of the electric car and on low voltage with the gasoline car. It is made in the form of a foot rest with ample width for two persons to place their feet upon it. It is well built, durable and compact.



K. P. Foot Rest Heater at Left; How Peerless Radiator Is Connected with Average Water Cooled Engine.

The engine heater is designed to keep the motor warm in a cold garage. It fits over the engine and a wire connects with the electric lighting system. The heat circulates around the motor, keeping it in good condition for starting at all times. At the average rate for current it costs about one cent an hour to operate.

The heaters made by Lehman Brothers, 10 Bond street, New York City, have been in use for many years in carriages and buggies. They consist of metal containers, covered outside with fabric or metal. They derive their heat from pressed coal, which burns very slowly and gives off ample heat without breaking into flame or giving off gasses. Many different types and styles, all operating on the same principle, are offered.

The Foss-Hughes Company, Market and Twenty-first street, Philadelphia, make a heater for front compartments, or for coupes and sedans, which can be fitted to any car on which the pan under the engine extends back under the floor boards. It is register, similar to those used in hot air house heating systems, that admits to the car interior the heat which is always around the engine under the bonnet.

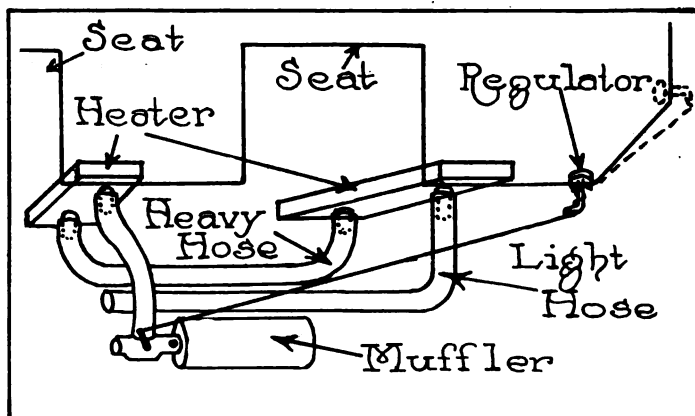
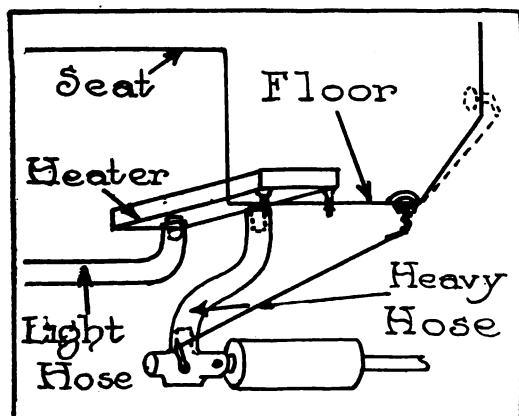
The Butler-Edwards Electric Company, Easton, Penn., offers a heater of the type which draws its supply from the exhaust gasses. The radiator is a neat, oblong metal device, which is placed in front of the passenger seat and behind the foot rest. The supply line is attached to the end of the muffler and it gradually grows larger, reducing the pressure and preventing back pressure that might interfere with the operation of the motor.

The radiator is of cast aluminum and together with the connections it weighs only 11 pounds.

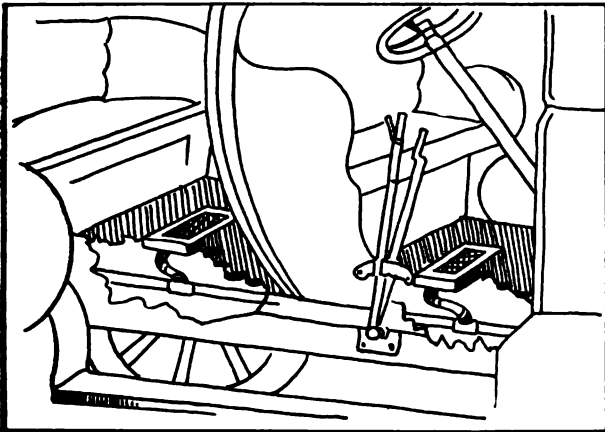
Another heater that uses the exhaust gasses as its source of heat is that produced by the American Auto Heater Company, 395 Ellicott square, Buffalo, N. Y. It is made of aluminum, which will neither rust nor corrode, and is contained in what appears to be an ordinary floor register. In this receptacle is a coil of radiating pipes, one end of which connects with the exhaust pipe. The other end is a small, separate muffler, designed to take care of any noise that might be caused by the cylinder explosions. It takes the gasses from the exhaust line before the muffler is reached.

The Reynolds Dull Flasher Company, 18 South Fifth avenue, Chicago, makes a heater which is in the nature of a register fitted into the floor boards of the front compartment in order to admit heat from the compartment about the engine.

The K. P. Foot Rest Heater Company, 230 West 54th street, New York City, has a cylindrical radiator in the shape of a foot rest to be installed in a tonneau. It draws off the exhaust



General Arrangement of Butler-Edwards Auto Heater; at Left, Sketch of Single Heater Layout, and at Right, Layout of Double Heater.



Installation of Milwaukee Auto Specialty Company's Radio Auto Heater.

gasses before they reach muffler and pipes them through the radiator. Provision is made to turn on the heat or turn it off quickly, to prevent noise, overheating and the escape of gas in the car.

The Hill Pump Valve Company, 20 E. Kinzie street, Chicago, produces the Utility heater, another device which makes use of the exhaust gasses. The radiator is in the form of a foot rest set in front of the rear passenger seat in a touring or closed car. A regulating valve inside the car controls the heat. The device is ornamental and it gives off no noxious odors and cannot burn anything. It can be permanently installed in half an hour by drilling two small holes in the floor of the car and one in the exhaust pipe ahead of the muffler.

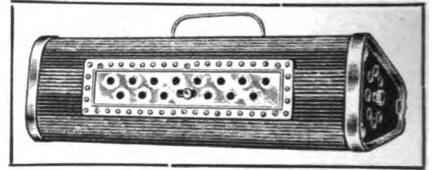
A Hot Water System.

A hot water heater is manufactured by the Peerless Radiator Company, Gibbs, Idaho, which is claimed to have distinct advantages over other types. It consists of a radiator in which hot water and air chambers are combined. In the case of a limousine or touring car two radiators may be installed, one for the rear and one for the front compartments. Methods of attachment to different cars are different, but in any case the piping from the passenger radiator is attached to water circulating system in two places, one where the water is hot and another where it has been cooled. The hot water is circulated through the heating device, which will retain the heat from two to three hours after the motor is stopped. It is said not to harm the motor, but

in reality benefits it by increasing the volume of water used in the cooling system.

The Chicago Flexible Shaft Company, La Salle and Ontario streets, Chicago, offer the Clark heater, in which "carbon" fuel bricks are burned. Model No. 7D is shown in an accompanying illustration. The Chicago company declares that one brick of charcoal, or carbon, as the composition is called, will burn with a strong and steady heat for about 16 hours.

The Radio auto heater, made by the Milwaukee Auto Specialty Company, 705 Chestnut street, Milwaukee, Wis., is an exhaust heater device. It consists of a hollow casting with a one-inch opening at each end, enclosed in a sheet metal box, which is attached to grilled nickel plated top or radiator that rests flush on the floor below the

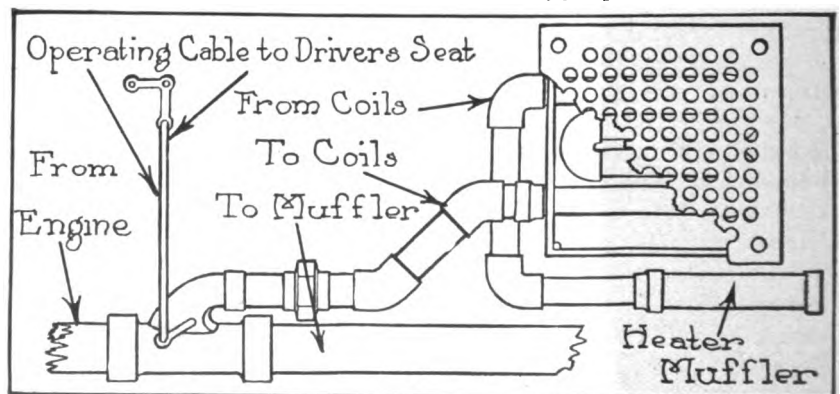


Carbon Burning Heater Made by Chicago Flexible Shaft Company.

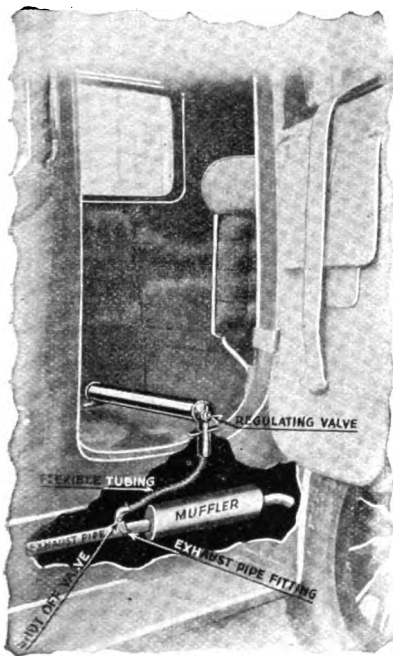
seat, as desired. The device is opened or closed by a lever arrangement which controls a

valve attached to the exhaust pipe. It is designed to prevent entrance of gas odors or road dust to the car. Another exhaust heater is that made by the Perfection Spring Service Company, Cleveland, O. A small valve on the exhaust pipe sends part of the heat through a flexible metal hose to the heater, from where it passes into the open air after having served its purpose. That purpose is to heat the copper tubes of the heater in the car. The degree of heat is positively controlled by operation by foot of a lever in the driver's compartment.

The Auto-Rad, made by the Brevando Manufacturing Company, Arlington building, Rochester, N. Y., is a radiator type placed in the seat



General Layout of American Auto Heater Company's Heating Device of the Exhaust Type.



Phantom View of Installation of the Utility Heater, Made by the Hill Pump Valve Company.

essential of comfortable winter motoring is proper anti-freeze mixture for the cooling system. Many preparations are on the market and every garage carries something for the purpose which it recommends. The service departments of the various makers usually at this time of year issue instruction sheets which cover the requirements for their cars. Tables of practical proportions of anti-freezing mixtures are given on page 26 of this issue.

MAKERS BACK SAFETY MOVEMENT.

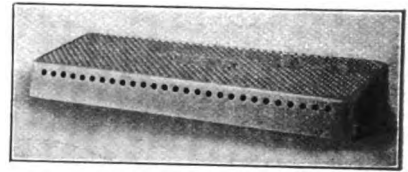
Speaking before the National Automobile Chamber of Commerce at the convention of the Safety First Federation of America, J. Walter Drake, president of the Hupp Motor Car Company, declared that the automobile makers were heartily in favor of the safety first movement. He said that many Detroit manufacturers had installed chassis testing machines in their factories partly to keep the testers off the streets, where they might cause accidents.

He further declared that the automobile manufacturers were not doing business especially to enable a few people to drive 30 or 40 miles an hour if they are not caught at it, but to make

front, as seen in the accompanying illustration. It gives off a gentle circulation of warm air, which comes from the exhaust pipe, and distributes it under the rugs, about the body. It adds only four pounds to the car's weight, and is finished as standard in black enamel, but can be supplied in special finishes to match any color scheme.

Another es-

the automobile the great modern vehicle. He said the manufacturer is for anything with-in reason to make life and property safe. He stated that the manufacturers would put any sort of an attachment on their cars that would be approved as increasing their safety.

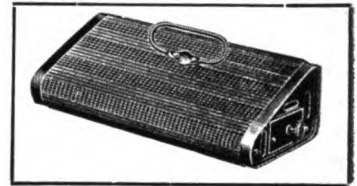


Passenger Heater Sold by the Consolidated Car Heating Company.

MASSACHUSETTS HEAD LIGHTS.

After an investigation extending over several months the Massachusetts Highway Commission has drafted a set of head light regulations which have been submitted to the governor, and, if approved, they will be in effect after Jan. 1.

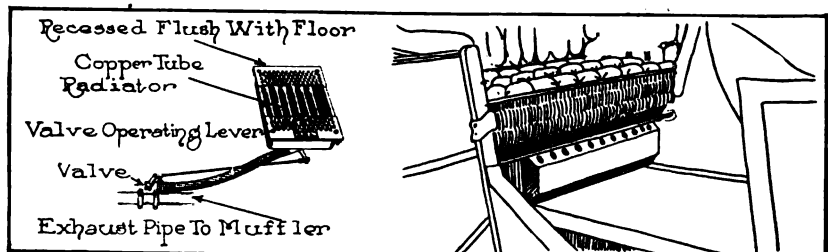
The regulations require sufficient light far enough ahead of a car to enable any person to operate at a reasonable and proper speed and to stop after seeing an object ahead before hitting it. It must be such that a pedestrian trying to walk



Lehman Bros., Auto Heater, Style 11-B.

across the road will be seen far enough ahead and on both sides so that he cannot suddenly step into the view of the driver so near to the car that it is impossible to stop. They must be so arranged that the light rays do not strike into the eyes of a person 50 feet away from the light. These regulations will require that lights be arranged so as to throw the light down instead of up.

The Motors Protective Association, New York City, has been incorporated and will protect its members against theft of their automobiles, and against overcharges by service stations and hotels.



Perfection Spring Exhaust Type of Heater at Left—The Brevendo Auto-Rad Heater at Right.

ENGLISH TARIFF HAS SMALL EFFECT.

THE duty of 33 1/3 per cent. assessed against American-made passenger cars in the new English budget has apparently had little effect on the importation of such cars into England, according to P. D. Saylor, managing director of the Goodyear Tire and Rubber Company of Great Britain, who has just returned to the Akron factories.

The demand for light cars is so strong, due to the shortage of both horses and cars, caused by the commandeering of both for the army, that purchasing goes on almost as before. The 40 per cent. income tax increase has begun to be felt, however, as has also the 50 per cent. tax on the profits of all business houses in excess of their average profits for the past two years.

Although large shipments of Goodyear tires have been received in London, they have not been sufficient to meet demands. On account of the departure of so many men to the war there has been a great demand for female labor and women have filled many places that were formerly held by men. The labor unions at first were inclined to resent this, but their opposition was avoided by paying women the same wages that men received. Mr. Saylor said that the rubber companies were making up the difference between a soldier's pay and the amount he had earned in peace and were sending that amount every week to the families the men had left behind.

The censorship is so far-reaching that all mail is opened and stamped with the censor's stamp. Large additions to tire capacity have been made by the manufacturers to keep up with war business and when war orders cease competition is expected to be very keen in the general effort to keep this new capacity busy.

FARMERS BUY MANY OVERLANDS.

The extent to which farmers now use motor cars is shown by the fact that at a plowing contest held recently at Big Rock, Ia., automobiles filled a large enclosure and overflowed into the road. A count showed that 870 cars were present and it is probable that 100 more were on hand for short periods during the day.

Fifty-nine different makes were represented, they ranging from the smallest and most inexpensive to the largest and most costly. There

were 107 Overlands parked on the grounds. This was a larger representation than any other medium priced car, and indicated that every eighth car driven by the people of the surrounding country is an Overland.

Since the first of June, when the new Overland 83 was announced, Overland dealers in the farm districts have doubled their sales of last year. This is due partly to bumper crops that have brought a great deal of money into the country, and partly to the preference which farmers everywhere are showing for the motor car as a means of transportation as against the horse.

OLDS PRODUCTION GROWS RAPIDLY.

Since the Olds Motor Works shifted its policy from the production of a small number of high-priced cars to that of smaller cars of medium price, the company has come to be one of the largest producers in the country. Model 43, a four-cylinder car, has been selling this year twice as fast as the original medium priced Olds put out last year.

During the months of August, September and October the sales of this car showed a gain of 133 per cent. over the sales for the same month of last year. This great gain might have been larger if cars were available for shipment. The business is holding up despite the approach of winter.

The company has been in an usually favorable position, with regard to production, owing to the fact that it completed a large three-story assembling plant just before the fast selling four-cylinder car was introduced.

STRANGE CARS IN NEW ENGLAND.

A member of the American Automobile Association who made a trip recently from Boston to Washington, declares that in his opinion there are more cars that come from other states passing over that stretch of road along the shore than any similar bit of road in the United States.

Omitting the New England states, New York, New Jersey and Pennsylvania from his calculations, he observed in two days numerous cars from Arizona, California, Delaware, District of Columbia, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Maryland, Missouri, Ohio, Tennessee, Texas, Virginia, West Virginia, Quebec and Ontario.

RESTA WINS SHEEPSHEAD INVITATION RACE.

The Best American Record for 100 Miles Bettered by 31 Seconds, but Brooklands Mark Still Stands.

IN THE 100-mile invitation races at the Sheepshead Bay Speedway, Nov. 2, Dario Resta won at a speed of 105.39 miles per hour. This was 31 seconds faster than the American record made by himself at the Sheepshead Bay Speedway during the recent 300-mile race, but 21 seconds slower than Resta's own time at the Brooklands (England) track.

It appeared that Resta, taking thought of his experience in the 300-mile race, when he wore out his car by excessive speed, held his pace down after he had the race well in hand. He was determined to win the prize money regardless of records.

Six drivers, all winners in some one of the speedway events of the season, entered the race for the Harry Harkness gold cup and \$12,500 in prizes. Mechanical troubles compelled three to withdraw before the end and only three finished. Burman, in a Peugeot, was second, at a speed of 102.4 miles per hour, and Rickenbacher, in a Maxwell, third at 98.3 miles per hour. Mulford, driving a Peugeot, gave Resta the hardest battle, but went out almost at the end of the race.

De Palma Beats Burman.

De Palma, in a 12-cylinder Sunbeam of large piston displacement, drove two heats, one of four

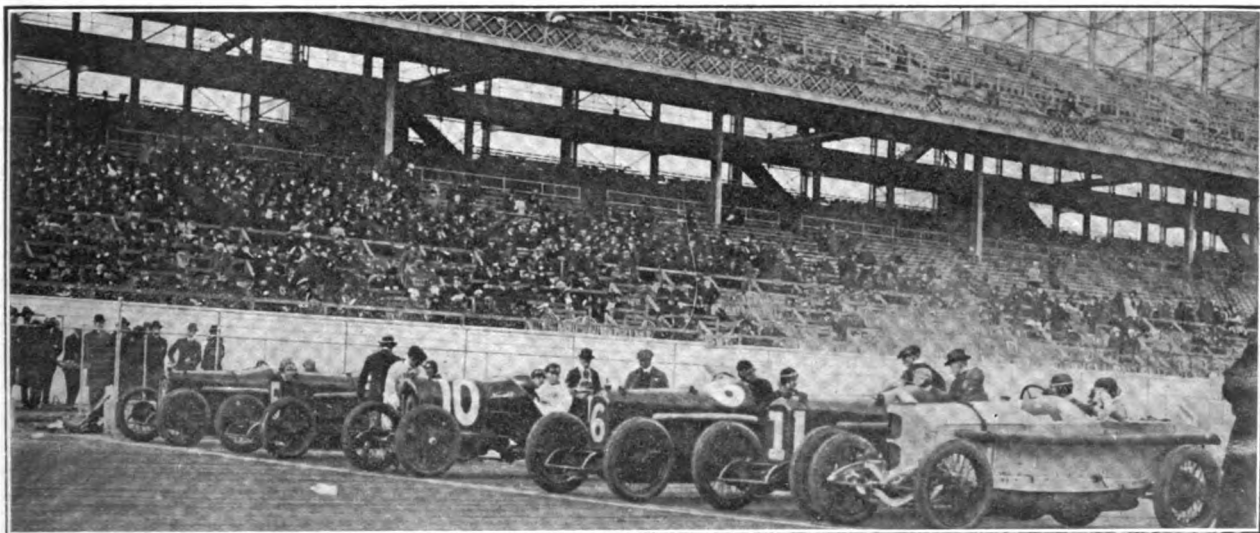
and one of six miles, with Burman in a Blitzen Benz and beat the German car in both events. He made the distance once at a speed of 112 miles an hour, and the second time at 114 miles an hour. In an exhibition heat against no competition, the Benz in Burman's hands, however, made 116 miles an hour, which is the fastest time that has been made for two miles on an American track. A stock Packard twin-six with a special body and some special motor equipment made several laps of the track. It was driven by its designer, J. G. Vincent, at 102¼ miles per hour, which is a record in stock car trials.

The New York public showed that it liked motor racing by turning out in a crowd of 30,000 people to see what can only be considered a minor racing event.

Six Cars Started.

There were six starters in the 100-mile race. Resta, Mulford and Johnny Aitkin drove Peugeots, and Burman was at the wheel of a smaller Peugeot. De Palma drove his Mercedes, with which he won the Indianapolis event, and Rickenbacher piloted the Maxwell in which he has been campaigning all season.

Aitkin took the pace at the start and was followed by Resta, Mulford, De Palma and Bur-



Lined up for the Start of the 100-Mile Invitation Race at Sheepshead Bay.

man, with Rickenbacher in last position. De Palma passed Mulford on the next lap and this order was maintained for 10 miles at a speed of about 106 miles an hour. At 11 miles Aitkin broke a connecting rod and went to the pits.

Mulford now took the lead. Five miles further on he lead the field by 150 yards and was gaining a little at every turn of the track. De Palma's car showed signs of motor trouble at 20 miles. He fell back, but kept in the running. Mulford lapped Rickenbacher at 24 miles.

Tire Changes Frequent.

The first tire change was necessary at 26 miles when Burman went in and came out in 24 seconds, making a change on a right rear tire. The next stop was by Mulford, whose tire blew out at the top of the turn, and he came in on the rim. Resta now had the lead.

Mulford changed in 20 seconds and went after Resta, but events proved that he was not to make up the time he had lost. He drove at about 110 miles an hour and gained gradually until he had reduced the lead to less than a mile. De Palma was lapped by Resta in the 33rd mile and at the 40 mark went to the pits and did not come out again.

At 48 miles Mulford had cut Resta's lead to half a mile, but at 50 he had to make another tire change and lost all that he had gained by his hard driving. Resta lapped him just as he left the pits, but Mulford again passed Resta and set out doggedly to make up his lost lap. Burman was third and Rickenbacher was following four miles behind.

Mulford was able to pick up from 50 to 75 yards on each lap. At that rate he would have had the lead again in 15 laps. But just after passing 76 miles the tread of his right rear tire, which had been causing all his trouble, came off and he had to go to the pits again. At 86 miles the right rear tire came off the wheel completely. He went to the pits. One mile further on his engine broke down.

Resta then settled down for the rest of the race with Burman and Rickenbacher too far back to make the finish interesting.

The wind was so strong that P. C. Millman was unable to make his expected flight by aeroplane from Garden City to the speedway. Jean Domenjos, the Brazilian airman, who was already at the field with his Bleriot monoplane, looped the loop and performed the "dead leap drop." The crowd was well satisfied with the afternoon and seemed to prefer the programme of shorter races to the long ones.

BIG SHEEPSHEAD BAY ALLOTMENT.

One of the most elaborate real estate allotment deals that has been before New York for some time has been undertaken by the promoters of the Sheepshead bay speedway.

Fifteen miles of water front is to be laid out in streets and cut up into canals, bulkheaded above the tide line so that motor boats may be kept in the back yards of the residents. In the centre of the property will be a motor boat speedway two miles in length. One of the largest golf courses in the country, with 36 holes, making it possible for 400 persons to play at one time, will be built and will be operated as a public links.

Two-thirds of the lots will have direct water frontage and the remainder will be within five minutes walk of the water. There will be 3000 city lots with a frontage on Sheepshead bay, Garritson's creek, Shellbank and Broad creeks. Anderson T. Herd is the chief figure behind the plan, as he is also behind the great speedway. Other men interested are Harry S. Harkness, Percy Pyne, 3rd, Ben Ali Haggin, H. M. Kilbourne and D. J. Boylan, president of the Coast and Lakes Contracting Company.

BOSCH AGAIN WINS AT SHEEPSHEAD.

In the Sheepshead bay races, Nov. 2, all the cars that were successful were again equipped with Bosch magnetos. Burman's Blitzen Benz made two miles at 116 miles an hour, and was equipped with both Bosch magneto and Bosch plugs. De Palma's victories over Burman in the 12-cylinder Sunbeam at 111.97 and 113.86 miles an hour were made with two six-cylinder Bosch magnetos, each of which ran $2\frac{1}{2}$ times as fast as the engine. Resta's 100-mile record at 105.39 miles per hour was made with the aid of the Bosch magneto, which was also equipment on every car to start.

FIVE NEW COMPANIES IN CHAMBER.

Five more automobile companies have joined the National Automobile Chamber of Commerce. They are the Milburn Wagon Company, Toledo, O., maker of the Milburn electric cars; Lewis Spring and Axle Company, Jackson, Mich., maker of the Hollier Eight; Argo Motor Company, Jackson, Mich., maker of the Argo gasoline car; Empire Automobile Company, Indianapolis, maker of the Empire, and the Consolidated Car Company, Detroit, maker of the Abbott-Detroit.

GENERAL NEWS OF THE INDUSTRY.

Goodyear's Report for Fiscal Year Shows Tremendous Business Done, and Other Reports Indicate a Healthy Condition of the Industry.

THE volume of business of Goodyear Tire and Rubber Company during the fiscal year ending Oct. 31 amounted to more than \$36,000,000. A much larger output is expected next year. Eight new buildings, with floor space approximating 10 acres, are being added to the Akron plant and a ninth addition will be made in the spring. The tire capacity is thus being increased 50 per cent. This year the company has been making steadily from 12,000 to 13,000 tires a day and over 2,000,000 were turned out during the fiscal year. That production is beyond the record of any other rubber company in the world. It is to be increased steadily to 20,000 tires a day. The number of cars running and using tires has been increased by half a million during the past year and next year 1,000,000 will be built and sold. The Goodyear company, according to President Sieberling, sold the car makers one-third of the tires used for original equipment during the year and expects next year to sell as many or more.

CHANDLER INCREASES CAPITAL.

While retaining control of the Chandler Motor Car Company in the hands of the former stockholders, the capital has been increased from \$425,000 to \$10,000,000. All of the new stock, except that issued to the old stockholders and \$3,000,000 held for future sale, has been sold by the same brokers who recently handled the new Chevrolet capitalization. The output of the company is expected to be expanded with this new money to 20,000 cars. Although the Chandler company is only a little more than two years old, stockholders during the past year received dividends of 100 per cent. on the common and seven per cent. on the preferred. Dividends totalling nearly 200 per cent. on the common have already been paid.

PEERLESS AND GENERAL VEHICLE.

The Peerless Truck and Motor Corporation has been formed to acquire the business of the

Peerless Motor Car Company. Control is held by the interests which built up the National Lamp Company, which was sold about three years ago to the General Electric Company, and the General Vehicle Company, owned by the General Electric Company. It is not made known yet whether the new concern will be dominated by the General Electric or Peerless interests. The General Vehicle Company owns the American rights for the truck designs of the German Mercedes company.

STUDEBAKER STOCK OFFERED.

The Studebaker Corporation has announced its intention to offer to the stockholders of the company for subscription at 110 per share of the 20,680 shares of stock now held in the treasury of the company. The offer will be for the holders of common stock of record as of Nov. 20, 1915. They will be permitted to subscribe to the stock in the amount of seven per cent. of their present holdings, and payment for the stock will be made on Dec. 6.

Out of the proceeds of the sale the company proposes to retire on the next interest date all of its \$2,300,000 outstanding notes, which ordinarily would not be taken up until 1922. After the retirement of these notes the corporation will be free of all debts save current accounts and will have a working capital of \$22,500,000, of which \$5,000,000 will be in cash.

The charter of the company provides that no dividends in excess of six per cent. can be declared on the common stock until the special surplus account for the amortization of the preferred stock amounts to \$2,500,000.

B. F. GOODRICH DIVIDEND.

The directors of the B. F. Goodrich Company, Akron, O., have declared the regular quarterly dividend of $1\frac{3}{4}$ per cent. on the preferred stock, payable Jan. 1, 1916, to stockholders of record Dec. 21, 1915.

HARRY FORD BUYS SAXON CONTROL.

Harry Ford, president of the Saxon Motor Car Company, is reported to have purchased the stock in that company which was owned by Hugh Chalmers. The deal is said to have involved \$500,000. It makes Mr. Ford the largest stockholder and gives him the control of the business.

The Saxon business was founded by Mr. Chalmers and other members of the Chalmers organization, including Mr. Ford, who was then secretary and assistant general manager of the Chalmers company, and Lee Counselman, Percy Owen, George W. Dunham, H. H. Pinney, C. A. Pfeffer, C. A. Woodruff and C. C. Hinckley. Messrs. Pinney, Pfeffer, Woodruff and Hinckley disposed of their interests some time ago.

The Saxon programme for the next year schedules the marketing of 28,600 cars.

NEW CHEVROLET PLANT IN CANADA.

The plant of the McLaughlin Carriage Works at Oshawa, Can., has been secured as a Canadian assembling plant for the Chevrolet Motor Company. The McLaughlins will also take over the direction of the plant of the Chevrolet Motor Company of Canada, which has a plant in west Toronto. They will be able to assemble 20,000 cars in Canada during the next year. The McLaughlins have a controlling interest in the McLaughlin Motor Car Company, Ltd., which assembles and markets the Canadian Buick. General Motors owns the remaining stock in the company.

ANOTHER WALPOLE DIVIDEND.

Permission of the court has been asked by the receivers of the Walpole Tire and Rubber Company to declare an additional dividend of five per cent. to unsecured creditors whose claims have been allowed, which will bring the total disbursements to creditors up to 90 per cent.

MAXWELL TO AID DEALER FINANCES.

To aid its dealers in securing loans with which they can pay cash for cars ordered in January and February, the Maxwell Motor Car Company has arranged to deposit portions of its surplus in banks all over the country with which its dealers do business. An amount equal to the

loans made to dealers will be deposited in each bank. The deposits will be for six months at three per cent. on certificate of deposit. The dealer will be expected to supply one-fourth of the cost of the car in cash, while he will be able to borrow three-fourths from the bank. In this way the factory hopes to be able to run at capacity during the dull months and receive cash for its shipments.

RUSSELL LOSES LESS MONEY.

At the annual meeting of the Russell Motor Car Company held in Toronto, Oct. 28, it was announced that the total number of orders on the company's books Aug. 1 amounted to \$2,000,000. A very large part of this work consists of war orders. The results of the last two years' operation are shown in the profit and loss account with a deficit of \$741,670, the loss for 1914 having been \$356,223, and for 1915 \$140,388. It is believed that profits from the business now in hand or in sight will make up the loss. The company's business in Australia has been sold and payments for it are to extend over several years.

REDUCES PAR VALUE OF STOCK.

The directors of the Kelly-Springfield Tire Company adopted at a special meeting a resolution that the certificate of incorporation be amended to reduce the par value of the common stock from \$100 to \$25 per share. The proposition will be placed before the stockholders at a special meeting to be held Nov. 30. The par value of the six per cent. cumulative preferred and the seven per cent. second preferred stocks will not be reduced.

ROTHSCHILD LEAVES LOZIER.

Maurice Rothschild, vice president of the Lozier Motor Company, has disposed of his interests therein to Theodore Friedberg of New York and Samuel and Henry Frank of Detroit. The three men now own all the stock, as Charles Shongood, another of the vice presidents, has also withdrawn. The reason given for the reorganization is that Mr. Rothschild is interested in Harris Brothers Company, Chicago, who operate the Chicago House Wrecking Company. The company will be continued as a going concern by its present owners.

FINAL CREDITORS' MEETING.

The creditors of the bankrupt Norwalk Motor Car Company, Martinsburg, W. Va., appeared before Referee Ben B. Wickham, in Cleveland, O., on Nov. 9, to pass upon the final account of the trustee of the estate, which showed \$982.02 in his hands for distribution. The meeting was to close the affairs of the estate of the bankrupt company.

NEW PRESIDENT FOR AUBURN.

Following the death of Charles Eckhart, president of the Auburn Automobile Company, Auburn, Ind., Morris Eckhart, who has been secretary, treasurer and general manager, has been elected to that position. F. E. Eckhart remains as vice president. J. I. Farley is made second vice president and sales manager; W. H. Denison, secretary, and F. B. Sears, treasurer.

TRUE GEMCO SALES DIRECTOR.

James B. True, Jr., has been made director of sales of the Gemco Manufacturing Company of Milwaukee. He was formerly connected with the Mitchell, Mallory & Faust advertising agency in Chicago, doing dealer work on large accounts. He is familiar with the automobile accessory business.

G. H. PHELPS PROMOTED.

George H. Phelps, formerly assistant to George C. Hubbs, assistant general sales manager of Dodge Brothers, has been promoted to advertising director in the same organization. In the future he will, in addition to having charge of all advertising, take care of the sales promotion work.

BAKER R & L DIRECTORS CHOSEN.

At a meeting of stockholders to fill vacancies in the board of directors the Baker R & L Company chose J. H. Wade, William J. Mather, D. Z. Norton, John H. Kling and Carl L. F. Wieber, Jr.

MURPHY NOW WITH CHALMERS.

Gail Murphy, the new advertising manager for Chalmers Motor Company, entered upon his duties on Oct. 25. Mr. Murphy previously was

associated with the Art Metal Construction Company in a similar capacity, and before that had been three years with the Burroughs Adding Machine Company, where he served for a time as head of the division of information and research and prepared literature relating to the product of the company.

NEW ELECTRIC OMNIBUS.

Frank E. Kirby, a well known marine architect and designer of passenger steamers, is interested in the Fuller Company of Detroit, which has just announced that it has perfected a new design of electric passenger 'bus that is expected to revolutionize city transit service.

The new car provides seats for 60 persons on two decks, which is 16 more than can be seated in a large street car. It is driven by four electric motors, one attached to each wheel, from current generated by a four-cylinder gasoline motor and a small dynamo.



Associated with Mr. Kirby are Rodolphus Fuller, an electrical engineer, who has handled electrical installations on Mr. Kirby's boats for 25 years, and Cameron D. Waterman, a Detroit capitalist.

WILLYS-OVERLAND MAKES DENIAL.

The Warner Manufacturing Company, Toledo, is in no wise connected with the Willys-Overland Company, according to a statement made by an official of the last named company. This announcement came after the general circulation of the rumor that negotiations were pending for the purchase of the Warner company by General Motors and that the former was run in connection with the Overland company.

JEFFERY CONVERTIBLE SEDAN.

The Thomas B. Jeffery Company, which recently offered a four-cylinder touring car at \$1000, now announces that it will supply a highly finished and handsome four-passenger convertible sedan body at a total price of \$1165.

The design of the removable sedan body is such that the lines blend harmoniously with the touring body. The whole body is built in the Jeffery factory and it looks like a permanent sedan top. The roof is of laminated wood construction covered with a fine quality of top material. The rear section of the body is metal and the supports and sills are of a very substantial character.

The top weighs only about 200 pounds, and

taking into consideration the removal of the summer top, adds only a little more than 100 pounds to the weight of the car. The glass used in the windows is 3/16-inch crystal plate, ground and polished. In the broad forward windows and in the doors the glass is arranged to drop half way. The rear window is



Louis A. Safford, Second Vice President, McQuay-Norris Company.

extra large, providing more than ample light and vision. Ample construction and padding between the top and the main body overcomes possibility of rattle. The padding protects the touring car body, so that refinishing is not necessary when the convertible top is taken off. The Jeffery divided front seats give the car the true sedan characteristic.

STUDEBAKER INSURANCE OPERATIVE.

John Bon, a Lithuanian, was the first employee of the Studebaker Corporation to die since the plan of group life insurance taken out by the company for all its factory employees went into effect. Proof of the death was forwarded on

Friday and on Monday \$500 was paid to the widow.

It was found that Bon had no money and part of the insurance payment was necessary to defray some of the expenses of his last illness. Without it the widow would have been destitute. She has no relatives in this country.

The plan of group life insurance adopted by the company, which pays all the premiums, is the first of its kind to be undertaken by any company in the automobile business. The great need for such an arrangement has been acute. Employers have been aroused to the number of deaths in their organizations which have been brought to light that have resulted in acute suffering because of lack of insurance or savings.

SAFFORD BECOMES VICE PRESIDENT.

Louis A. Safford, well known through his long connection with the Automobile Trade Journal as manager in Chicago, has become second vice president of the McQuay-Norris Manufacturing Company, St. Louis, maker of Leak-Proof piston rings. He will have charge of sales and advertising.

Mr. Safford, a native of Grand Haven, Mich., acted for 10 years as Detroit correspondent of the Associated Press before entering the automobile field.

NEW PEERLESS DIRECTORATE.

Both D. D. Wagoner, president of the General Vehicle Company, and L. H. Kittredge, president of the Peerless Motor Company, are being mentioned prominently as probable members of the directorate of the new Peerless Truck and Motor Corporation. It is expected that the officers and the directors will be chosen before the end of the second week of November.

W. A. Brush and Mason P. Rumney have been named by George W. Dunham to serve with him as a committee in charge of next summer's annual cruise of the Society of Automobile Engineers.

J. D. Cotton has been appointed advertising manager of the Four Wheel Drive Auto Company of Clintonville, Wis.

J. L. Larkin and H. A. Minturn, formerly assistant sales manager and advertising manager, respectively, for the Haynes company, have joined the Sun Motor Car Company, Buffalo.

PROVIDENCE SHOW TO BE BIG EVENT.

PLANs for the fifth annual show of the Providence Automobile Dealers' Association have been formulated, and these plans, under the guidance of Percival S. Clark, general manager, embrace some very unusual features in the way of exhibiting motor vehicles to the general public. There will be much entertainment, aside from the actual show of automobiles, that will appeal to everyone.

Two weeks before the opening, which takes place Nov. 12 and continues to the evening of the 20th, Manager Clark advised that in all there had been promised 194 pleasure cars and 103 commercial trucks as exhibits, and these included most of the leading makes in this country. The motorcycle division will be an important section. In addition to these hundreds of makers of accessories and equipments of all kinds, not excepting motoring apparel and camping outfits, are scheduled to set up booths.

One feature of the exhibition will be the large number and variety of 1916 seat designs, including staggered seats and several of what might be termed as "freak" arrangements. The tendency of body designs will be thoroughly demonstrated, as will the several types of multiple cylinder motors that have occupied the attention of motorists during the past six months.

The whole exhibition, which as usual is to be held at the State Armory under special permission of the Rhode Island Legislature, will be staged in a setting of rare beauty, and one that is entirely new. The general scheme will be that of a southern palm garden, with palms and a variety of exotic plants in which live canaries will flit about. The ceiling, draped to represent the firmament, will be studded with approximately 100,000 electric light bulbs, and the walls will be covered with mural decorations.

Human song birds in the persons of several noted soloists from Boston have been engaged to give concerts. In the centre of the big drill room the Edith A. Hughes Woman's Orchestra will occupy a large stand, and, under the direction of Miss Hughes, will entertain the visitors during afternoons and evenings. In the basement another section of the same orchestra, under the leadership of Miss Louise Bixby, will hold sway.

The Providence show will afford the public its first opportunity of the season to view the innovations that have been brought forth for motorists within the past 12-month. Every facility

and requirement to make things comfortable and entertaining for spectators has been anticipated, and the prospects now are that the show this year will establish a record for interest and attendance.

958 CARS VISIT YELLOWSTONE.

Since August, when Yellowstone park was opened to automobile tourists, 958 cars, carrying 3513 persons, have made the trip through the park. Persons who entered in all conveyances numbered 24,293 in the same period, which is a ratio of one automobile tourist to every seven tourists travelling by other means.

This is regarded as a remarkable showing in view of the fact that the roads to and from the reservation were understood to be in rather bad condition. The park has been opened to other classes of travel for 17 years and is thoroughly known. There is expected to be a larger portion of automobile travel next year.



Percival S. Clark, Manager of Providence Automobile Show.

AUTOS IGNORE WARNINGS.

According to J. A. McRea, general manager of the Long Island railroad, 23 automobilists last month ignored the railroad's warning of danger at its crossings. Only three persons were injured and this result is attributed to the alertness of the company's engineers and motor men. Twelve of the 23 violators plunged through the company's crossing gates, breaking eight of them. Four traffic sign posts were damaged, as well as many lantern posts.

ANTI-FREEZING SOLUTIONS FOR WINTER USE.

Practical Advice on How to Avoid the Freezing of the Water Cooling System During Cold Weather.

“THE car should never be allowed to stand with the water in the cooling system during cold weather, unless you have first filled the cooler with some good anti-freezing solution,” is a warning to be found in practically every motor vehicle instruction book. Unfortunately, there are many who have read this advice, but fail to heed it until the cold weather arrives

is likely to be at the lowest. Those who make it a practise to journey to the country for the week end, where the machine will be exposed to the elements, will do well to drain the water from the cooling system each night.

There are a few experts who do not approve of the use of anti-freezing solutions in the cooling system, claiming that such are detrimental to the metal parts. There can be no doubt that alkaline solutions, which are electrolytes of high potential, produce electrolytic action whenever two metals of different potential are used together; but when the car is stopped in any cold place for a considerable period, an anti-freezing solution of some kind is an absolute necessity if the car is to be of service.

Three Popular Mixtures.

Three of the most commonly used ingredients are alcohol, glycerine and calcium chloride. The first two may be mixed together, but the latter can only be mixed with water. Calcium chloride is the most favored by many motorists because of its low cost, it being generally about 10 cents per pound. In the pure state it occurs in prismatic crystals, which are soluble in about a quarter of their weight in water. The mixture should be prepared in a separate vessel so that frequent tests can be made with a piece of blue litmus paper. If the color of the paper should turn to a red after immersion in the liquid, it is positive proof that acid is present. It should be neutralized by adding a small quantity of milk of magnesia.

When denatured alcohol is used as the basis for an anti-freezing solution, it is only necessary to pour in the fluid when the motor is running. If two quarts of alcohol are poured into the average cooling system, the mixture will not freeze until a temperature below 18 degrees above zero is reached. It should be remembered that alcohol produces an ignitable gas and, therefore, the motorist should never try to determine the exact amount of fluid in the cooling system by holding a naked flame at the mouth of the filler cap. Many persons are each year painfully burned about the face through this carelessness.

The boiling point of alcohol is at 172 degrees Fahrenheit, and that of water is at 210 degrees.

SOLUTIONS AND FREEZING POINTS.

Calcium Chloride.

	Freezing point Degrees F.
1 pound salt—1 gallon water.....	27
2 pounds salt—1 gallon water.....	18
3 pounds salt—1 gallon water.....	1.5
4 pounds salt—1 gallon water.....	-17
5 pounds salt—1 gallon water.....	-39

Alcohol and Water.

	Freezing point Degrees F.
Water 95%, Alcohol 5%.....	25
Water 90 Alcohol 10	18
Water 85 Alcohol 15	11
Water 80 Alcohol 20	5
Water 75 Alcohol 25	-2
Water 70 Alcohol 30	-9
Water 65 Alcohol 35	-15
Water 60 Alcohol 40	-23

Water, Alcohol and Glycerine.

	Freezing point Degrees F.
Water 95%, Alcohol-Glycerine 5%.....	28
Water 90 Alcohol-Glycerine 10	25
Water 85 Alcohol-Glycerine 15	20
Water 80 Alcohol-Glycerine 20	15
Water 75 Alcohol-Glycerine 25	8
Water 70 Alcohol-Glycerine 30	-5
Water 67 Alcohol-Glycerine 33	-15
Water 60 Alcohol-Glycerine 40	-23

Glycerine.

	Freezing point Degrees F.
Water 95%, Glycerine 5%.....	30
Water 90 Glycerine 10	28
Water 85 Glycerine 15	25
Water 80 Glycerine 20	23
Water 75 Glycerine 25	19
Water 70 Glycerine 30	15
Water 65 Glycerine 35	12
Water 60 Glycerine 40	5
Water 50 Glycerine 50	-2
Water 45 Glycerine 55	-10

and catches them unawares. The time is fast approaching when the freezing temperature will prevail and it will therefore be well for all motorists to familiarize themselves with a few of the anti-freezing mixtures frequently used.

If the car is stored in an unheated garage, the hood at least should be covered each night before leaving, as it is at this time that the temperature

It is obvious that a mixture of the two will heat more readily than water and consequently when the temperature is mild overheating may occur. As the temperature of the mixture rises, the alcohol naturally evaporates and it is therefore necessary at regular intervals to replenish the supply. The exact amount needed to obtain the proper percentage can best be determined by the use of a hydrometer. This instrument is inexpensive.

A good mixture can be made of alcohol and glycerine. This combination does not heat so readily as the other mixtures, since the boiling point of glycerine is 554 degrees Fahrenheit. The minimum cost of glycerine is about \$2.50 a gallon. When using this fluid as a basis of a mixture it will be well to inspect all joints to determine that they are as tight as possible, because of its tendency to creep.

When preparing the anti-freezing mixture, allowance should always be made for expansion. Should the system be filled to the brim in mild temperature much of the fluid would be lost through the overflow pipe in the radiator. This is the result of expansion. This propensity is found especially in glycerine, as it does not dry nor evaporize, but to the contrary, has a tendency to increase its bulk.

It is a good plan before using the anti-freezing fluid to thoroughly flush out the system. Open all petcocks and drain away the water, after which the petcocks should be closed. Next make a saturated solution of washing soda and warm water and pour the same into the cooling system. Run the motor for about 10 or 15 minutes and then open all petcocks and drain away the mixture. The system should then be flushed through several times with clean water. The accompanying table shows the approximate freezing points of the anti-freezing mixtures according to the percentages used.

OVERLAND CAR IS MINE MOTOR.

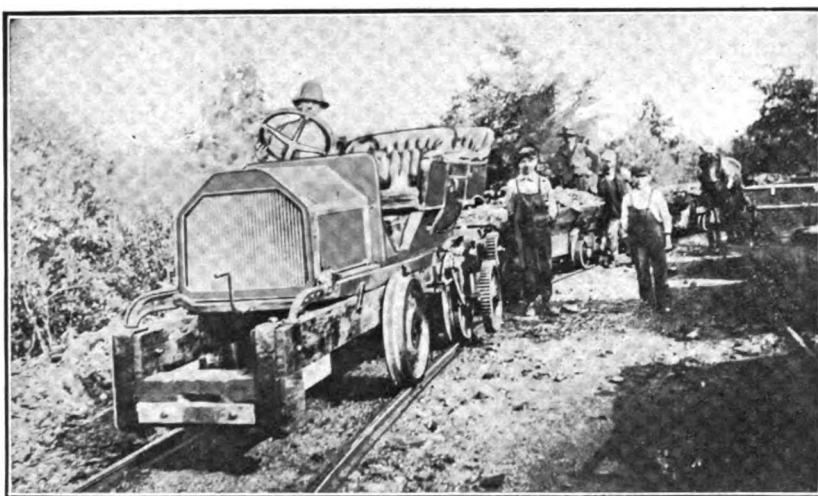
Among the unusual uses to which passenger automobiles have been put, one of the most remarkable to come to the attention of the Willys-Overland Company, is the use of one of its cars in a Pennsylvania coal mine to haul coal from the

interior of the mine to the tippie.

This work was formerly done by mules, but the owners of the mine, which is at Brisbin, Penn., realized that mules were slow and expensive. They fixed up an Overland passenger car and found that it took the place of a \$2000 mine motor perfectly. It hauls an average of 15 loaded cars on each trip.

Tonnage produced at the mine has increased 500 per cent. since the Overland went on the job, but it still handles it successfully. The body, the hood over the motor and the steering wheel remain the same, but the wheels have been replaced by heavy, flanged iron ones of the railroad type.

The chassis has been fastened to a heavy frame work of wood and iron, which raises it several feet off the ground. The mechanical units, such as the transmission and the differential, still



Overland Passenger Car Adapted to Take Place of Mules and Motor in Mine Work.

remain the same. The cost of making the change was small.

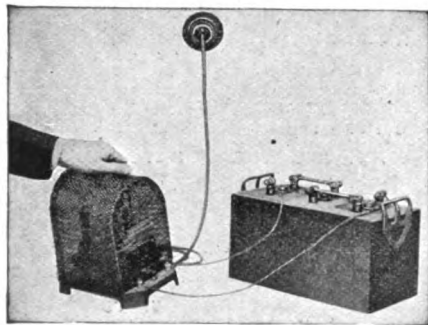
O'DONNELL DRIVES TO COAST.

Eddie O'Donnell, star of the Duesenberg racing team, and the driver to finish in third place for the season of 1915, purchased a Mitchell six after his final winning of third place in the Astor Cup race and started for the Pacific Coast with his family. He expects to make the trip by way of Denver and Salt Lake City in 20 days.

Until 18 months ago he was a tester for the Mitchell-Lewis Company at Racine and left that position to become a Duesenberg mechanic. Shortly afterward he was given a car to drive and this year made himself the star of the team.

BATTERY RECTIFIER OF WIDE UTILITY.

OF GENERAL interest is the announcement that the General Electric Company, Schenectady, N. Y., is building a new mercury arc



Rocking a New Type General Electric Rectifier to Start It Charging.

rectifier for charging small batteries, such as are used for lighting and ignition in motor cars and motor boats, for operating electric bells, for electro plating and for numerous other uses where not more than five amperes and 15 volts of direct current is required and only alternating current is available.

The rectifier has a metal base in which are mounted reactance coils and a rectifier tube in a suitable cover, the whole being encased in a perforated metal shield. It will charge one three-cell, one six-cell, or two three-cell batteries, and it is automatic in that it is self-adjusting to any of the three requirements. It will charge a single battery at a rate of approximately six amperes from a 100-volt alternating current supply.

The rectifier can be supplied for 60, 50, 40, 30 or 25-cycle, 110-volt alternating currents. The total weight of the 60-cycle rectifier is 15 pounds, and its outside dimensions are $6\frac{1}{2}$ by $9\frac{1}{2}$ by 11 inches. Consequently, it can easily be carried around, making it unnecessary to remove the battery for charging.

To start operations it is only necessary to connect the rectifier to an ordinary light socket and connect the corresponding poles of the rectifier and the battery. The mercury is started in motion by slightly tipping the rectifier, after which no further attention is necessary until the battery is charged. When two batteries are to be charged they should be connected in series.

The cost of charging a 12-volt battery or two six-volt batteries for a 10-hour charge is about 13 cents at one mill per kilowatt.

MANY V MOTORS MADE.

Figures compiled by the Cole Motor Car Company indicate that 85 per cent. of the pro-

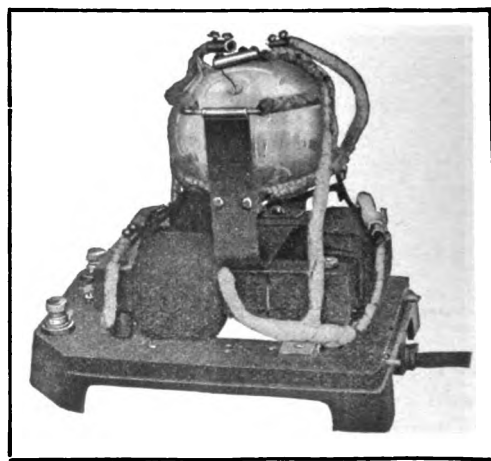
duction of cars costing more than \$1750 are this year made in multiple-cylinder types. This is a remarkable result in view of the short time since the eight was put on the market. The company feels assured of a rapidly increasing demand and plans next year to greatly expand its production.

OHIO CHAUFFEURS ORGANIZE.

An organization for Ohio chauffeurs has been formed under the name of the Ohio Automobile Operators' Association, Inc., and comfortable quarters have been secured in Cleveland for the first branch. This consists of club rooms and parking space for 200 cars where the men can leave their cars and enjoy themselves while they are waiting down town for the call of their employers. Four hundred members have already been secured in Cleveland. Branches of the organization will be formed throughout the state. The association hopes to exert some influence on the new law concerning the registration of chauffeurs in Ohio, which is shortly to be passed.

BIG DEMAND FOR SHOW SPACE.

Although the drawing of space at the annual shows in New York and Chicago held early in October indicated that the shows would be larger than any held previously, Manager S. A. Miles has since been called upon to make 157 additional allotments. Indications are that the production of cars next year will be much larger than this year. Even with 700,000 cars produced and sold there was a shortage of at least 300,000 cars this year.



The Rectifier and the Base with the Sheet Metal Cover Removed.



THE first manufacturer to build eight-cylinder cars in two sizes is the Jackson Automobile Company of Jackson, Mich., whose line for the next year will consist of a light four-cylinder, a light eight-cylinder and a large cylinder eight. All have Northway motors, the full elliptic springs which have been characteristic of the Jackson cars for years, and are well finished and fully equipped.

The four-cylinder car engine is an L head type that is said to be exceptionally well balanced. The cylinders have bore of $3\frac{1}{2}$ inches and stroke of five inches, with tungsten steel valves. The crankshaft is $1\frac{3}{8}$ inches diameter and is mounted on three main bearings. The power plant is of a

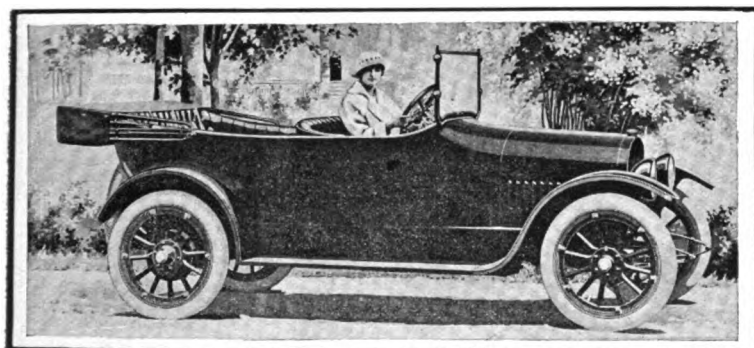
carburetor is a Schebler model R. The ignition current is supplied by an Auto-Lite generator battery system. The starter is coupled to the flywheel by a Bendix drive. Fuel is supplied to the carburetor by the Stewart vacuum system.

Ball and Socket Gear Shift.

The three-speed transmission gearset is controlled by a ball and socket type of shifting lever located in the centre of the driver's compartment. The rear axle is a full floating type with ball and roller bearings. The tractive effort is through the rear springs. The wheelbase is 112 inches, 56-inch tread, and the tires are 32 by four inches.

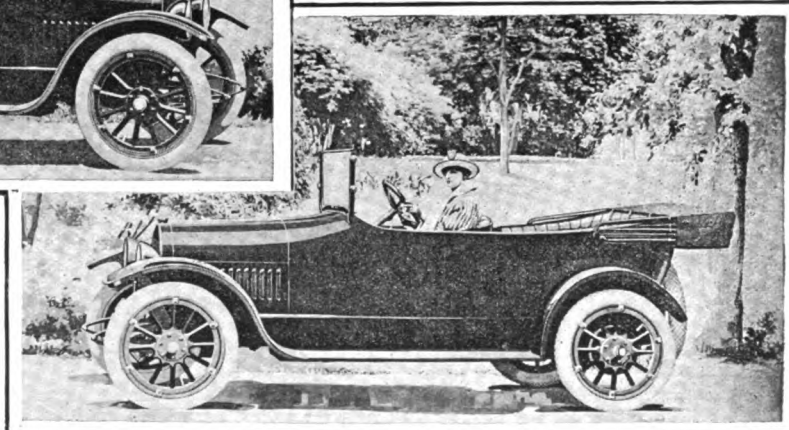
The equipment includes all the usual accessories. The slow speed speedometer is driven from the transmission gearset main shaft.

The Northway motor in the large eight-cylinder car is a care-

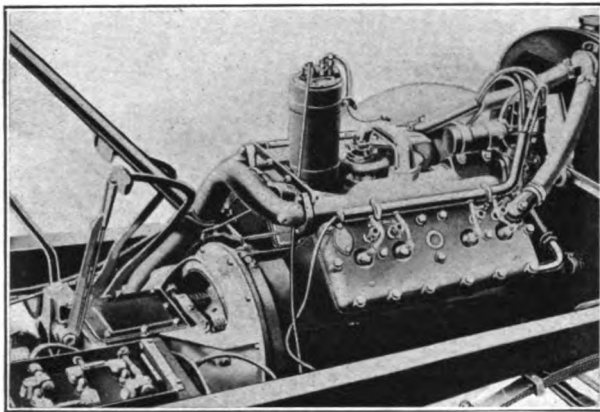


unit type and is suspended at three points.

Lubrication is by an adjustable plunger pump, which supplies oil through a sight feed on the dash to the main bearings, whence it drains to troughs underneath the connecting rods for splash lubrication of the remaining bearings. The



Top, Jackson Model 34 Four-Cylinder Car; Bottom, Jackson Model 34S, Light Weight Eight.



Unit Power Plant of the Jackson Model 348, Eight-Cylinder Light Weight Car.

fully balanced L head type, with removable cylinder heads, tungsten steel valves and cylinders having $3\frac{1}{2}$ inches bore and stroke of $4\frac{1}{2}$ inches. The unit power plant is suspended at three points. The crankshaft is $2\frac{1}{8}$ inches diameter and is carried on three main bearings.

The lubrication is by a pressure system in which a plunger pump drives the oil to the crankshaft bearings, through channels drilled in the crankshaft to the connecting rod bearings and through the hollow connecting rod to the wristpins and cylinder walls. The piston is provided with scraping rings to return the excess oil to the crank case. An instrument on the dash indicates the pressure of the oil, which may be varied at will.

Fuel is fed by the Stewart vacuum system. The carburetor is a model R Schebler, with a variable nozzle opening adjustable from the steering column. The ignition current is supplied by an Auto-Lite battery generator system.

The clutch is a leather faced cone with a flexible pressed steel spider for easy application. This spider is very light to avoid prolonged spinning and make engagement easy. The ball thrust bearing is lubricated through a duct in the crankshaft from the motor.

The three forward speed ratio transmission gearset is supported on annular ball bearings with chrome nickel steel gears and nickel steel transmission shafts. The shifting mechanism is a ball type. The rear axle is a full floating design, similar to that in the four-cylinder car, and the springs are full elliptic front

and rear. Brakes are internal and external on the rear wheels, two inches wide and 14 inches in diameter. The driving effort is through a torsion tube with two universal joints and radius rods.

Small Eight Design Similar.

Except for the size of the cylinders and numerous other chassis parts, the light eight-cylinder car is in duplicate of the larger machine. The important dimensions are: The cylinder bore is $2\frac{7}{8}$ inches and the stroke is $4\frac{3}{4}$ inches, and the $2\frac{1}{8}$ -inch crankshaft, the same size as in the larger engine, is carried on two instead of three bearings.

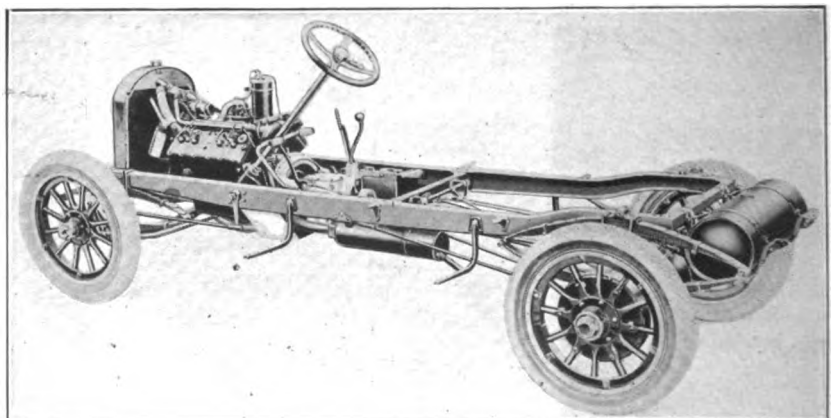
The wheelbase is 112 inches and the tires are 32 by four inches. The brakes are 12 instead of 14 inches in diameter.

For nine years Jackson engineers have consistently used full-elliptic springs. These afford remarkable riding comfort. The difficulty of securing the springs to the axle, owing to the fact that in this type of spring stresses are concentrated on one fitting, while in other types these are taken by two or more, is overcome by the use of exceptionally large and strong fastenings.

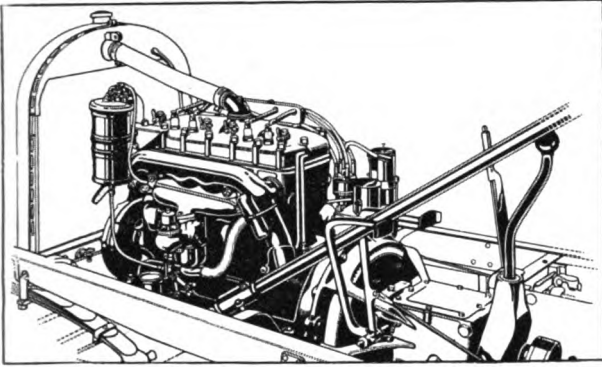
In the large eight-cylinder car chassis radius rods take the driving strain, and there is also a torsion rod. In the two smaller chassis the drive is taken through the springs, this design being intended to obtain the greatest flexibility in the drive.

The propeller shaft is an open type with a universal joint at either end. The rear axle gear ratio of the small eight and four is 4.4 to one and of the large eight 4.25 to one. The forward and back motion of the drive shaft is compensated by mounting the front universal joint on a splined shaft. This is easier to enclose and the housing insures better lubrication.

On all cars the electrical lighting and ignition



Chassis of Jackson Eight-Cylinder Car, Model 68.



Model 34 High Duty Motor Is Cast En Bloc and Crank Case Is in One Part with Cylinders.

system is the Auto-Lite, in which the distributor is combined with the generator. The starting motor is mounted low on the engine and it drives the flywheel through a Bendix coupling.

Streamline Body Designs.

The bodies of touring type for the two smaller chassis are for five passengers, and of the large eight for seven passengers. Runabout bodies may be had on the four and the small eight, but the larger car is made with a seven-passenger body only.

The bodies are full streamline, with rounded edges and concealed door handles, and are very handsome and substantial. The standard colorings of the large six is dark blue for the body, with hood and fenders of black enamel. For other colors an extra charge of \$25 is made.

The light eight is finished dark green with natural wood wheels. An extra charge of \$25 is made when this car is finished in special colors. The finish of the light four body is fur-

nished in Brewster green as standard.

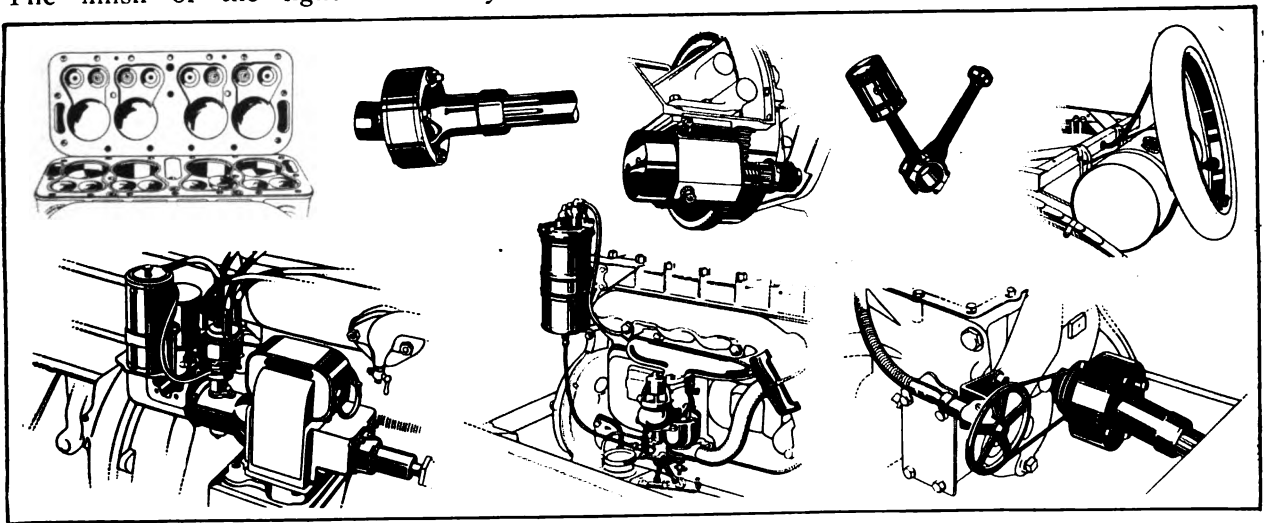
The equipment includes a one-man dreadnaught top, Collins curtains with curtain openers on the doors, rain vision windshield, a high-grade slow speed speedometer driven from the transmission gearset shaft, electric Auto-Lite starting lighting system with two units. The motor has been designed so that a motor driven tire pump can be attached if desired.

MICHIGAN SERVICE MEN ORGANIZE.

With assistance of the National Automobile Chamber of Commerce, given through Alfred Reeves, its general manager, the service managers of automobile manufacturers in Michigan northern Ohio and western Ontario recently formed an organization at a meeting in Detroit.

The association is to promote personal acquaintance between the service men, and to consider the best methods of conducting the work and of securing dealer co-operation. Meetings will be held every month. The Indianapolis service men are already organized and similar bodies will be soon formed in Chicago and Cleveland.

The officers of the new organization are: President, C. R. Lester, Packard; vice president, E. P. Rippengill, Hudson; secretary-treasurer, E. H. Hazelton, Regal. The executive committee is formed of J. L. Kenyon, Cadillac; H. O. Weisse, Oakland; H. G. Fitch, Overland; C. W. Matheson, Dodge; Charles Gould, Maxwell; Pierre Schonn, General Motors Truck Company.



Top Row, Left to Right: Detachable Cylinder Head of Model 34, New Design Universal Joint, Auto-Lite Electric Starter, Piston and Connecting Rod of the Eights, Tank and Spare Tire Carrier; Bottom Row, Auto-Lite Direct Current Generator, Stewart Vacuum Tank, Speedometer Drive.

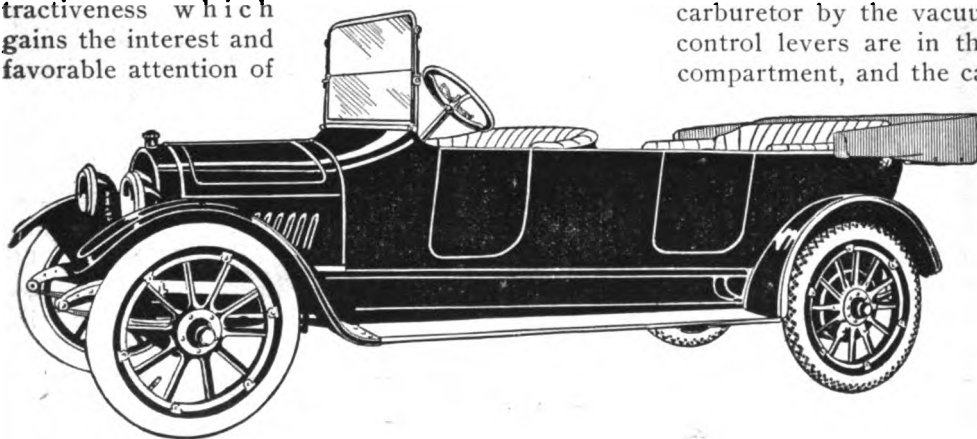
NEW CUMMINS MONITOR CARS.

A Four-Cylinder at \$795 and a Six at \$895, Composed of 350 Less Parts Than the Average Car, Are Offered.

SIMPLICITY of design so ingeniously worked out that the makers have found it possible to build a car with 350 less parts than are used in the average vehicle is the chief characteristic of the Monitor car produced by the Cummins-Monitor Company, Columbus, O.

These cars are made from components produced by the best parts makers, all of whom have strong national reputations for quality of products. The completed cars have been subjected to the hardest sort of service in the hands of many drivers and have proved exceptionally efficient.

Especial attention has been devoted to the body design, which is a streamline type of great beauty. The car has in large measure that attractiveness which gains the interest and favorable attention of



The Standardized Cummins Monitor Car for 1916.

the prospective buyer at sight. It is unusually well finished in detail.

Careful attention to the springs and car balance have given the chassis unusual riding qualities, and large power in proportion to weight insures quick acceleration and fast hill climbing.

The four-cylinder Monitor car is known as the "4-30." It has a unit power plant with clutch and transmission built up to the motor, a construction that has been adopted by the great majority of designers of light cars.

The ignition current is supplied by a high-tension magneto. The carburetor is an automatic float feed type. The car is equipped with an electric starting and lighting system. The control levers are in the centre of the front compartment

and the driver sits at the left side of the car. Hyatt roller bearings are very generally used throughout the chassis. Tuthill springs, designed especially for the car, are included in the construction. The upholstery is genuine leather. The top is a one-man design of mohair material. Wheelbase is 108 inches. The equipment includes every accessory and convenience that is usually provided for a motor car. The price of either the roadster or touring type is \$795.

The six-cylinder chassis, like the smaller car, has a unit power plant. It is known as the "6-40." It is equipped with a lighting and starting system with generator ignition and a carburetor of the float feed type. Gasoline is supplied to the carburetor by the vacuum feed system. The control levers are in the centre of the front compartment, and the car has left hand drive.

The springs are semi and three-quarter elliptic design and are extra long. The wheelbase is 115 inches and the weight of the car complete is 2400 pounds. The price is \$895. The company is in a position to make reasonably prompt deliveries.

The factory and offices are at 298 Mt. Vernon avenue, Columbus, O.

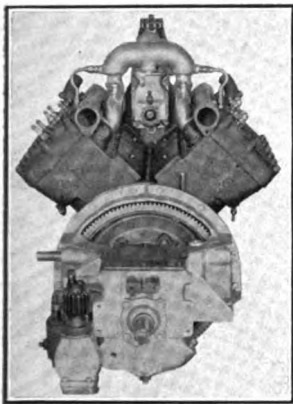
The recent tropical storms in the Gulf of Mexico have created a sand bar in Tampico harbor. This prevents ships of greater than 19-foot draft passing out, so that it is now possible for the oil tankers to sail with only one-third of a cargo, which is unprofitable. As a result of this only a little more than 800,000 barrels of oil were shipped in September of this year as compared to 900,000 last year. The production, however, is large and much more could be sent out. A new well that came in early in September is a gusher of 90,000 barrels a day capacity and near it is another well which produces 100,000 barrels.

THE CHARACTERISTICS OF THE EIGHT-CYLINDER ENGINE.

By CHARLES S. CRAWFORD, Chief Engineer of the Cole Motor Car Company.

(A Paper Presented at the Indianapolis Section, S. A. E., Oct. 29, 1915.)

NO ONE thing in the engineering field today has been subjected to closer scrutiny and study than the gasoline engine with multiple cylinders. Advocates of the various types have discussed the relative and respective virtues of each. It is my privilege in this paper to enumerate and analyze the characteristics of the eight-cylinder, V type engine.



The Cole-Northway Eight-Cylinder Motor.

The eight-cylinder engine should not be regarded as a so-called "twin." It is a well-rounded mechanism of eight co-ordinating cylinders, possessing characteristics different than those of any other type of engine that has preceded it.

In discussing the eight I have taken three things into account: First, that the principle of the eight-cylinder, V type engine, as it is now applied, is sound from an engineering standpoint. Second, that it represents a standard of commercial value attained by no other type. Third, that it is a product which, as the best proof of its practicability, during its first year of active and continuous service, has won for itself a place in the forerank of the industry by sheer performance.

Little more than a year has elapsed since this type of motor was first produced commercially in this country for automobile use, but while much has been done in the matter of research on this particular type of engine, equally aggressive steps have been taken in the production of other combinations and numbers of cylinders.

The appearance of the multiple cylinder engines may be attributed to several things: First, to the general tendency to high-speed, high-efficiency engines with limited capacity of individual cylinders, the dimensions of which are confined within the limits to which it is possible to obtain a maximum efficiency from one cylinder of given displacement. Second, the need for smoother running engines for the larger types of cars. Third, a means of giving to the purchaser better car performance at a lesser cost, by the opportunity the eight's construction offers to reduce the manufacturing cost. Last, the advantages the construction affords to realize certain ideals which with other types of engines we were unable to attain.

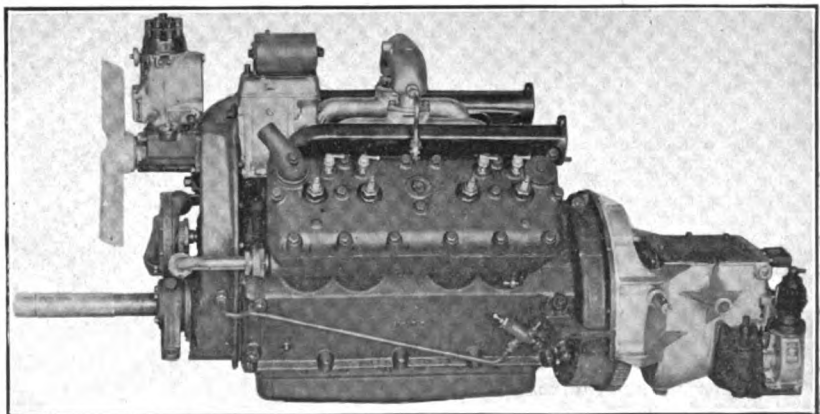
Each type of engine has its own characteristics, standard of efficiency, and measure of ability to do certain things; each, a relation between this said ability, the relative complications (or shall we say simplicity) and cost per degree of merit.

The measure of perfection and the standard required has for the layman no meaning so long as he has nothing upon which to base a comparison. In other words, the standard by which a man would judge a product depends solely upon his personal judgment, based on his experience with something similar in nature but different in performance. For that reason we have to designate the standard of merit not only by the actual value of performance in certain directions, but by its relation to other features.

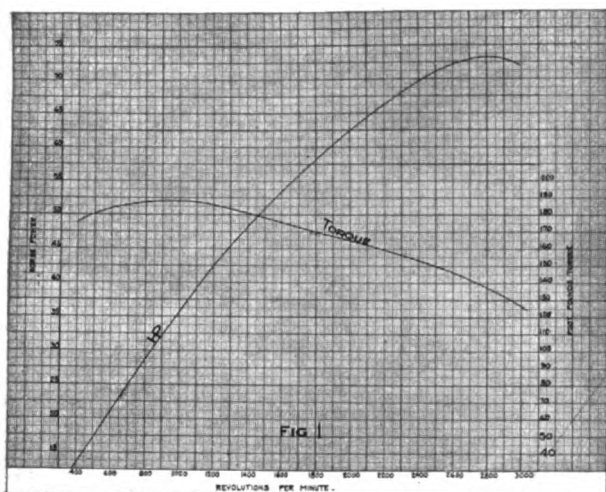
This condition existed respectively with the single, the two, the four and the six-cylinder engine, and now, due to the aforesaid reason, we have before us the eight and the twin-six.

While there is, to some extent, a degree of novelty in some of the latter issues, it can, on the other hand, be shown that there was a deficiency in the earlier types.

This was obviously true of the single and two-cylinder engines. Their deficiencies were conspicuous because of their inability to perform in an effectual manner and it was up to the engineer to produce an engine that would measure up to the work required of it. The fours and sixes were a decided improvement over the single and two-cylinder engines, yet they only approached the standard of efficiency which the automobile engineers hoped ultimately to attain. They did not have



General Layout of a Typical Eight-Cylinder Engine, Which Mr. Crawford Discusses.



Horsepower and Torque Curve of the Cole Eight.

the capacity to give the necessary performance within wide limits.

But then came the eight. It filled a long-felt want and gave the necessary performance for which the automobile engineers had so long striven.

Essentially the capacity required of an engine is to propel a vehicle of a given mass at a certain maximum speed (which is limited, first, by the desires of the driver, and, secondly, by the limitations of the highway), as well as to give the necessary power of acceleration. We could, therefore, assume that the engine's size or its displacement would be proportional to the mass or size of the vehicle.

If we argue from the basis of ideal cylinder displacement, we would find that we were practically held in our selection, in so far as we could only adopt a definite construction within the limits imposed by the maximum and minimum cylinder capacity.

It is generally recognized that the useful cylinder bores vary between three inches and 3½ inches, while the stroke may vary between the ratio of 1½ and 1¾ to one. In support of this contention we refer to the performances of European engines where there are respectively examples of the smallest and largest bores, each with the same piston displacement and with a correspondingly large and small stroke-bore ratio, yet both engines giving equally satisfactory performance.

To proceed, however, we can see that on this basis we would define the various types of engines as having a specified sphere of usefulness in so far as the relation of car size to cylinder displacement is concerned. But it is not the mere matter of cylinders alone. It is more truly, the commercially correct numerical combination that will afford the greatest capacity and performance, with a definite relation to the other factors, upon which the proposition depends. These may be exemplified as follows:

The efficiency of the combination (meaning both the thermal efficiency, based on the relation of output to fuel consumed, and the mechanical efficiency of the mechanism) and the general performance in the application of the energy developed, and its relation to the simplicity, initial cost and maintenance.

Here let it be emphasized that without the aforesaid relation of simplicity and cost it is not possible to determine the relative merit, which must be a maximum in order to give the purchaser a specific value.

The foregoing resume defines the situation in respect to the points which occupy our minds in the determination of the most suitable power plant, and with the assurance that has come with a year of observation, that for its specific purpose as a commercial product the V type eight is undoubtedly ideal and its limits of application wide enough to meet any normal requirements, it is my intention to present the characteristics which support this stand.

In fairness to ourselves I shall find it necessary to draw comparisons, but not with the intention of underrating other products.

At the outset let me recapitulate previous assump-

tions and make clear that the ideal engine would be the one that had the greatest degree of simplicity—the least number of parts—and the best characteristics relative to that degree of simplicity.

For instance, we have a four-cylinder engine. It has certain features characteristic of its construction. It gives certain results because of its inherencies, and yet its development and refinement can add to its value within the defined limits of simplicity and can make it perform to better advantage. This is the relation of the engine's all-around efficiency to its simplicity, which is its measure of merit, and this, as stated, can be varied in proportion to the stage of development.

However, it is clear that there is a limit to which this development can be carried. There are certain features in construction which prevent the attainment of ideals in certain directions which may be existent in other types by virtue of their fundamentals.

To begin with, the eight, to wit, the eight-cylinder Cole-Northway, V type engine, is particularly suited to the size of car for which it was designed. We could not have had the characteristics with a lesser number of cylinders, while a greater number, should it have been 10 or 12 or more, would have brought the cylinder sizes down to undesirable dimensions and would have added complexity to the unit without giving a proportional increase in adaptability.

The attainment of the ideal engine for the required displacement must have a maximum available torque; a frequency of impulse sufficient to render the engine smooth (the torque frequency being that applied to the road wheels), and a speed range that covers these desiderabilia without excess, consistent with the standard of merit, as we have chosen to designate the relative value.

Now the Eight, as we have it, answers all of these requirements, and, as a commercial product, compared with its nearest neighbor, the Six, of equal piston displacement—has the advantage in initial cost—a greater degree of merit in this respect to begin with.

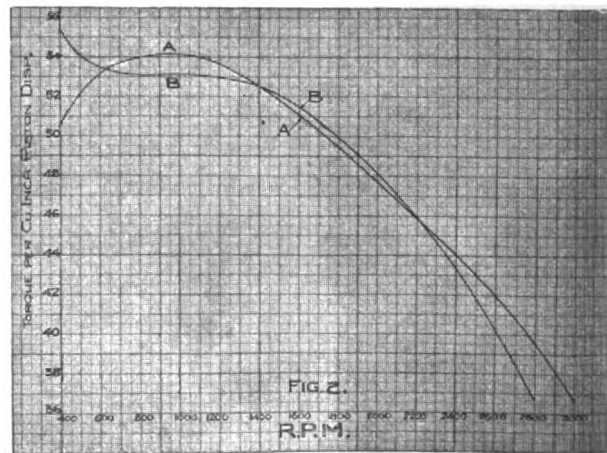
From the standpoint of simplicity, it achieves a standard that places it ahead of other multiple-cylinder types.

From the point of durability, the Eight is better because of the superior rigidity which it possesses, and this is conducive to longer life. I might point out here that the internal rigidity, as found in the Eight, is a most essential factor. And remember that the considerations of rigidity are quite distinct from those of actual strength.

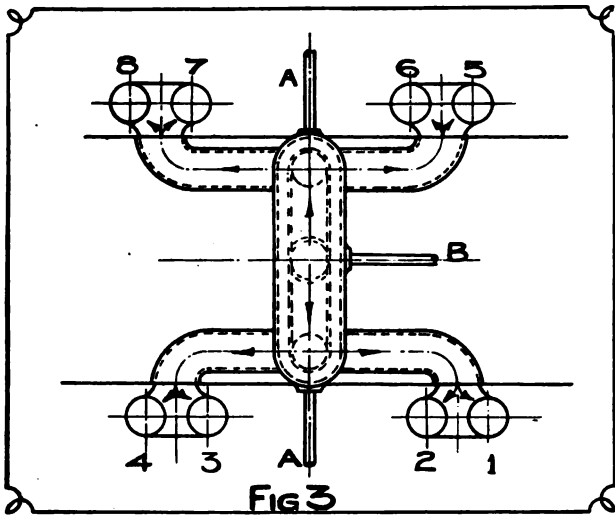
The compactness of the Eight-cylinder engine is greater by far than that of the Six. It occupies much less space in a chassis of given length. This affords a great deal more room for the body. It can be made large and commodious without excessive overhanging, which is bound to handicap the performance of the car.

The fundamental requirements to attain the desired "range of ability, smoothness and minimum noise" can now be determined. These, as you know, were defined as the essentials of the ultimate motor car.

But before going into the discussion of these points consider this:



Torque Developed Per Cubic Inch of Piston Displacement.



Lay Out of Manifolds to Scale in Cole Eight.

What are the ends that these motor cars we are building are intended to subserve? Are they to be mechanisms which embody such engineering extremes that they will be good only for show case display in a Smithsonian institution? Are they to be mere short-lived fads designed to appeal simply from the point of their unusual design and construction, or because they tempt the intrepid motorist who represents less than two per cent. of the motor car buying public? Or are they to represent real scientific advancement and be permanent assets that subserve your needs and mine—the needs of the average motorist—with maximum efficiency and economy, and have power enough and to spare to do everything that the average motorist desires, without affording an extravagant excess that from the standpoint of utility represents a sheer waste and causes an unjustifiable increase in maintenance cost?

"RANGE OF ABILITY."

The required range of ability, which in substance means the capacity of the engine to do the ordinary thing and to answer every day requirements, is that which can be utilized in practise, and a speed range that will give a car from two to 60 miles an hour in high gear is, as we all know, ample.

The desirable torque must be maintained throughout the useful speed range, and this the eight-cylinder engine does.

This range of capacity depends upon the ability to run the engine to reasonably high speed without detrimental vibration and to arrange the gear ratio in rela-

tion to the highest speed that can be developed with a maintenance of torque.

To illustrate this: If an engine running at 2600 revolutions per minute can, with a given gear ratio, make a car go 60 miles per hour, then the necessary size or displacement of the engine can be determined by the torque necessary to reach this speed in a given time, or with a given acceleration, say, of from 10 to 50 miles per hour in a certain number of seconds.

This will then utilize to advantage all the power the engine can develop at its highest useful speed, which is limited by the volumetric efficiency at the said speed, or the ability to maintain a proportional torque. To attain this result is simply a matter of design and the proper development of the power plant.

Fundamentally, the torque developed is dependent on the displacement and the mean effective pressure on the pistons. Given a full charge in the cylinders by volume, this pressure is proportional to the energy of the mixture.

To illustrate this point more clearly: There is a certain mixture of gasoline and air which, with normal quality of gasoline, is about one to 14. This is the most efficient from the point of perfect combustion, which means that the energy which we derive from it on its combustion is a maximum consistent with the heat energy in the fuel.

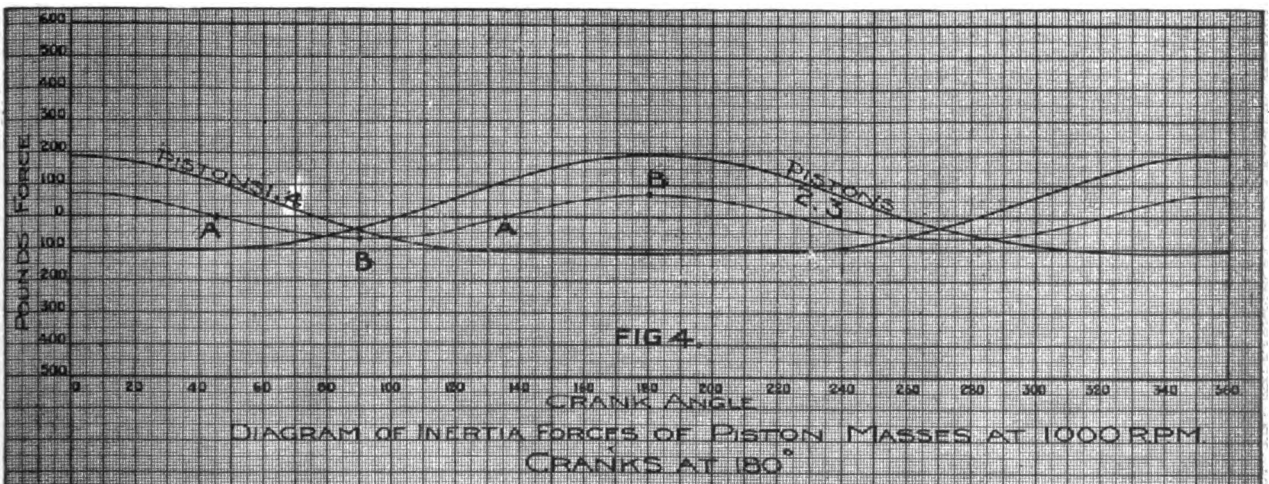
It is possible to increase the explosive pressure by an increase in the strength of the mixture, that is, an increase in the heat energy of the mixture, and this can only be accomplished by having the maximum weight of gasoline and air.

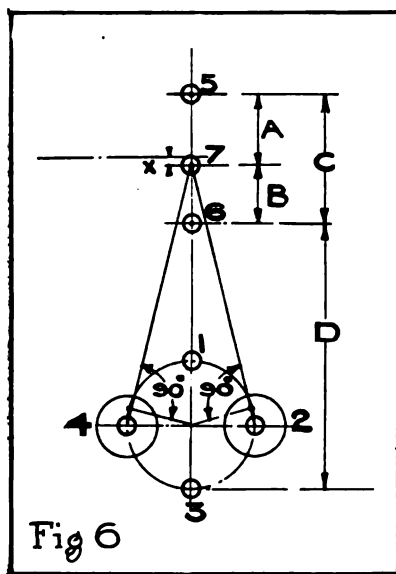
We might have the best of volumetric efficiency from a valve timing viewpoint and yet the heat energy of the charge would not be a maximum if it were of too high a temperature or partially expanded before entering the cylinder.

Excess compression of the charge in the cylinders does not add to the pressure. We still have the same quantity of heat units in the mixture and by excessive compression we do not increase these. More work is done on the compression stroke, and though the initial pressure is higher there is no net gain in work on the crank shaft.

Thus it follows that the chief advantage of increasing the compression is to obtain rapidity of ignition at high speed and not to increase the torque at low speed. With an eight-cylinder engine, properly designed, we secure every advantage necessary for practical purposes, therefore, without incurring the danger of trouble plus by going beyond that point. The torque developed in an eight should be and is greater than that of a twin-six with the same displacement, for there is a greater heat loss with an increased number of cylinders.

The area of cylinder wall exposed is proportionately greater, the displacement being the same, and when it is considered that approximately 60 per cent. of the heat energy of the fuel is lost through the cooling water and radiation, the fallacy of too great a number of cylinders with a consequent decrease in individual cylinder dis-





The Four Positions of Crankshaft.

quently lower compression, is bound to possess advantages in this respect and must of necessity give a smoother operation at the lower speeds.

"SMOOTHNESS."

Defined, smoothness is the mode of application of the torque or the minimum angular variation in turning effort on the crankshaft, which is a function of the impulse frequently and the means adopted to store the torsional energy and eliminate the fluctuations.

So much for the engine smoothness of the torque applied. Now consider the frequency of impulse at the road wheels and it will be seen that this will depend on the gear ratio, as with an increase in gear ratio and likewise increase in engine speed, there will be a proportional increase in frequency at the road wheels. This is as important from the standpoint of smooth running as is the engine frequency.

Variation in angular velocity, due to the number of cylinders, is insignificant when the car is in motion, for the weight of the vehicle acts much in the manner of an immense flywheel after a certain speed is attained, regardless of the number of cylinders. The explosions blend so thoroughly into one another that they constitute virtually a continuous flow of ceaseless energy.

Smoothness is also a result of efficient carburetion

placement becomes evident, while the presumption that, by reason of the small bore and increased compression it is possible to increase the available torque, also, is shown to be fallacious.

Engines with small bore and necessarily high compression, while being advantageous at the very high speeds, invariably give unsatisfactory operation at lower speeds, and it is always necessary to retard the spark in order to prevent knocking. It follows, necessarily, therefore, that the eight,

with its larger bore and conse-

and the equal distribution of the mixture to the cylinders. This insures equality of cylinder work and uniform pressure at all points. On the other hand, the careful balancing and reduction of weight of the reciprocating and rotating parts consistent with strength and rigidity will give equal inertia to all connecting rod and piston masses.

The foregoing conditions characterize the fundamental necessities to accomplish the desired results. I will now proceed to feature the capabilities of the eight in fulfilling these conditions; its inherent constructional features, which are conducive to this attainment; the particular characteristics that stand out as its good points; the degree of development which makes possible the attainment of characteristics inherent in other designs, and the length to which we have gone in our endeavors to refine the eight similar to the way in which the four has been developed in Europe, in spite of the claimed superiority of the six-cylinder principle or the principle of the twin-six.

ACCELERATION AND TORQUE.

As we have defined the desirable range, we can assume that with the engine running at 2565 revolutions per minute, in order to get a road speed of 60 miles per hour with 35-inch wheels, eliminating allpage, a gear ratio of 4 5/11 to one is required. From this basis, establishing a definite acceleration, the necessary displacement of the engine to get the torque essential, can be determined.

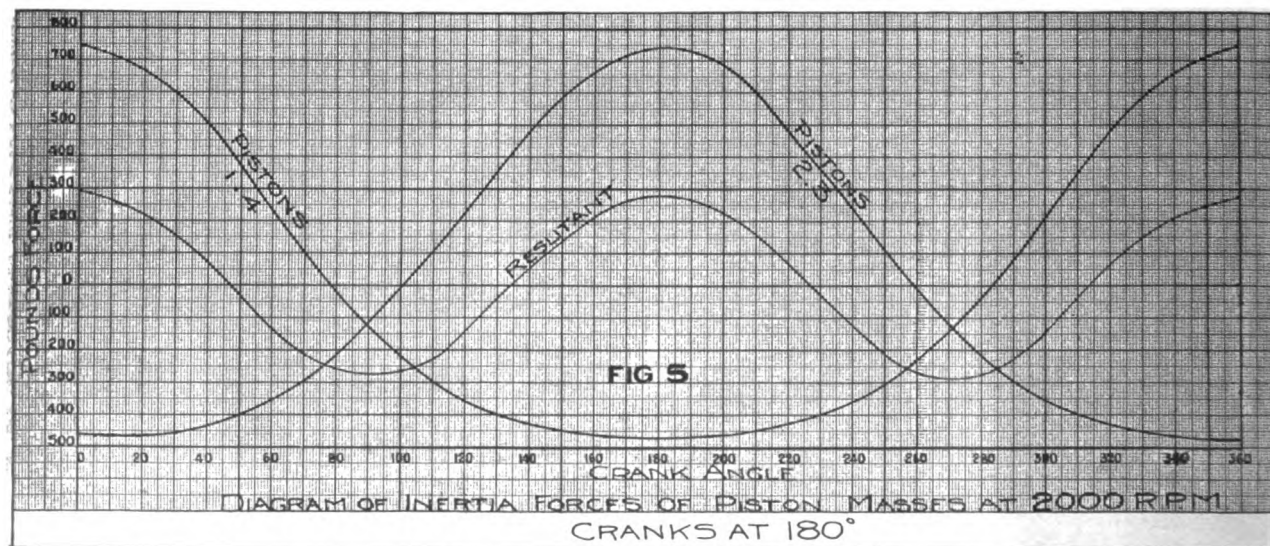
In the light of the performance of powerful multiple-cylinder cars, the acceleration of from 10 to 50 miles per hour should be accomplished in from 20 to 25 seconds.

Cole eight stock jobs well run in, carrying three passengers and with windshield and top up, will give an acceleration of from 10 to 50 miles per hour in from 22 to 24 seconds. The motor has a piston displacement of 346 cubic inches, giving a maximum torque of 187 1/2 foot-pounds.

The horsepower and torque curve of this engine is shown in Fig. 1, while in Fig. 2 is shown the torque developed per cubic inch of piston displacement. Incidentally, the torque developed per cubic inch of piston displacement of a twin-six engine is also shown in Fig. 2.

In this figure "A" represents the curve of the eight-cylinder engine, while "B" designates that of the twin-six under similar conditions.

The torque in the eight is conventional, inasmuch as the most efficient speed is in the neighborhood of 1000 revolutions per minute, which corresponds to 750 feet per minute piston speed. This is only what could be expected, for at this speed the gas velocity is at a maximum, consistent with the manifold friction, while the volumetric efficiency is a maximum, by reason of the relation of this velocity and the time element of the valve openings. The temperature at this speed is consistent with good thermal efficiency, and the relative curves show, also, where the cooling theory has its effect on the thermal efficiency.



COLE "8."**Bearing Pressures Due to Inertia and Explosive Forces.**

Cylinders, $3\frac{1}{2}$ bore=9.62 square inches.
 Maximum explosion pressure=2700 pounds.
 Inertia forces of piston at 1000 R. P. M.=186 pounds.
 Inertia forces of piston at 2000 R. P. M.=747 pounds.
 Area connecting rod bearing=4.54 square inches.
 Unit explosive pressure on bearing=587 pounds per square inch.
 Unit inertia pressure at 1000 R. P. M.=41 pounds per square inch.
 Unit inertia pressure at 2000 R. P. M.=165 pounds per square inch.

TWIN-SIX.

Unit explosive force=871 pounds per square inch.
 Unit inertia pressure at 2000 R. P. M.=379 pounds per square inch.

Table No. 7—Referred to on Page 33.

At the lowest speeds it is virtually impossible to have a greater torque than at any other speed if a normal torque is developed at the usual speed of maximum torque, because the gaseous inertia, on which we rely to a great extent to fill the cylinders, has not reached a point where it can overcome the skin friction of the manifold, the port and the valve openings and still maintain a reasonable velocity.

These statements and those which immediately follow will correct the assumption left with us on a previous occasion that, by reason of multiple cylinders, it is possible to get the maximum torque at the lowest speeds of revolution.

Since the torque is proportioned to the horsepower and speed, and therefore can be deduced from a factor which is constant, it is difficult to see how it would be possible to obtain from horsepower curves which are similar in characteristics torque curves which are so widely different at the lower speeds. Yet this is precisely what is inferred from the characteristic curves of single-six and twin-six engines of approximately equal capacity, brought previously to our attention.

The torque frequency has no influence on the magnitude of the torque developed at lower speeds. However, the ability to attain increased volumetric efficiency and better distribution of the charge is responsible for the actual increase that does occur.

Where the eight scores in generating increased torque at lower speeds is in its undoubted ability to distribute the mixture to better advantage. In support of this contention a layout of the manifolds to scale is shown in Fig. 3, which presents clearly the equidistant port locations and the comparatively short distance of each from the carburetor.

The importance of limiting the manifold lengths to obtain good volumetric efficiency and likewise torque at the lower speeds being obvious, the ability of the eight's construction to give this condition stands out prominently, and is thus seen to be more pronounced than in any other type of multiple-cylinder engine.

The efficiency of the carburetor, by reason of constant jet suction, is logical in the eight, while the suction strokes if closer together, as in the twin-six, produce an excessive lap which creates at some point almost double suction in the manifold.

In regard to frequency of impulse it is asserted that the frequency is proportional to the number of cylinders. The actual frequency at the road wheels is the determining factor, however, and this is dependent on the gear ratio.

UNBALANCE AND VIBRATION.

Smoothness from the point of engine balance is the next point that requires study. In the conventional four's there are, from their inherent design and construction, unbalanced forces due to inertia, which increase with the square of the speed. This unbalanced force is fundamental in the four, but not necessarily in the eight, as is commonly supposed.

While the forces do occur as calculations show, there must be a fair amount of discrimination in discussing the relative balance of mechanisms that have respectively unbalance and perfect balance, viewed theoretically.

There are two fundamentally distinct problems in connection with the vibration and balance. There are the vibrations that arise from unbalanced systems, considering all the parts as rigid within themselves, and vibrations or sources of vibration due to the elastic yielding or springing of the parts of the system—such as the crankshaft, which is subject to bending and torsion; the connecting rod, which acts as a strut and obeys the law as such in connection with rigidity, and sustaining members, such as the engine crank case.

The vibrations arising from lack of rigidity in the crank case can be attributed to the influence of the forces on either side of the plane of symmetry.

Supposing the engine was articulated at the middle, or plane of symmetry. We can see that each half would rock against the other in a symmetrical manner, influenced by the couples exerted by the centrifugal and inertia forces on the crankshaft.

The stress of the crank case section at its middle point, therefore, resists this tendency, the magnitude of which increases with the length of the crankshaft and crank case, and an absence of rigidity, therefore, would result in a vibratory bending of the engine itself.

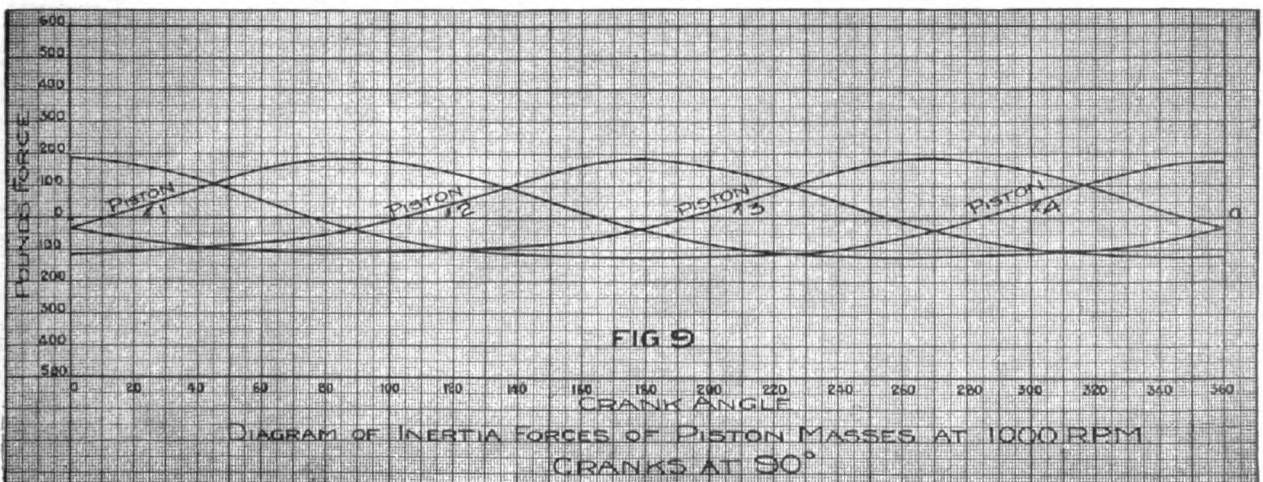
The shortness of the crankshaft and crank case and consequent rigidity of the eight, therefore, is distinctly favorable.

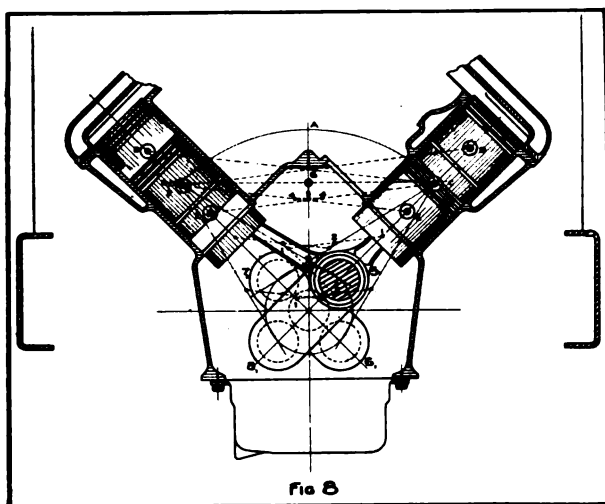
Likewise, the counter-balancing of the crankshaft eliminates to a marked degree the couple due to centrifugal forces and therefore the vibratory tendency is practically expelled.

So far as the inertia unbalance of the eight is concerned, it is advisable to consider this, to some extent, to show that this is not objectionable.

At the outset it would be wise to remark that while the horizontal vibratory force does exist, one is usually surprised at not being able to notice it when riding in an eight-cylinder car.

In order to show the actual magnitude of this vibration tendency at different speeds, curves labelled Fig. 4





End View of Crankshaft, Showing Pitch of Cylinders.

and Fig. 5 are shown. Fig. 4 represents the magnitude of the unbalanced forces of the pistons in each block at 1000 revolutions per minute, and, as will be noticed, they are very small. Since this is the normal running speed, it explains the reason why vibration in the eight is not perceptible.

That this is true is more evident when you consider the effect of a force of this order acting upon the mass of the engine and the chassis. Imagine, for instance, applying a force of 70 pounds on a mass weighing 3500 pounds, suspended on springs, by starting with zero and gradually increasing the force to the maximum in a time space corresponding to the periodicity of the revolutions. You could not feel it and this is exactly the condition that exists in the curve shown. At point "A" there is no force, but it is applied almost uniformly up to the maximum of 70 pounds at point "B."

At 2000 revolutions per minute, which is a high rate of speed, and one not used for long periods, the forces increase as shown in Fig. 5. The forces plotted are the actual magnitudes as calculated for a $3\frac{1}{2}$ bore motor with aluminum pistons, as per table No. 11.

It has previously been shown why this unbalanced condition exists, but in order to give a better idea and to elucidate more logically the points to which reference is made later in the paper, I have added diagram, Fig. 6. The four positions of the crankshaft are shown respectively, at 1, 2, 3 and 4 while 5 and 6 are the top and

bottom of, the piston stroke, respectively, point 7 being at the position of mid-piston travel. If the connecting rods were of infinite length all four pistons would reach mid-stroke position at the same instant and at all other points, pistons 1 and 2 would have the same motion as pistons 3 and 4. With the connecting rod of finite length, however, the positions of mid-stroke and mid-crank pin travel do not coincide, the error being as shown at "X."

Now the inertia of the piston masses, or the energy stored in them, tending to keep the pistons in their state of motion, is dependent on the velocity or acceleration and the mass. As will be observed from the diagram, owing to the angularity of the connecting rod and the position of the pistons at mid-crank pin travel, piston No. 4, travelling upward, will have farther to go than half-stroke by the amount "X" or a total "A," while the piston going down will have less than half-stroke by the amount "X" or the distance "B," to travel in the same time, which is in 90 degrees of crank pin travel. Therefore, the speed on the up stroke of the piston will be greater than on the down stroke, which explains the difference in the inertia of the piston up and down respectively. This is the magnitude of the inertia unbalance and has the effect of an external force equal to the difference of inertia of the pistons up and down.

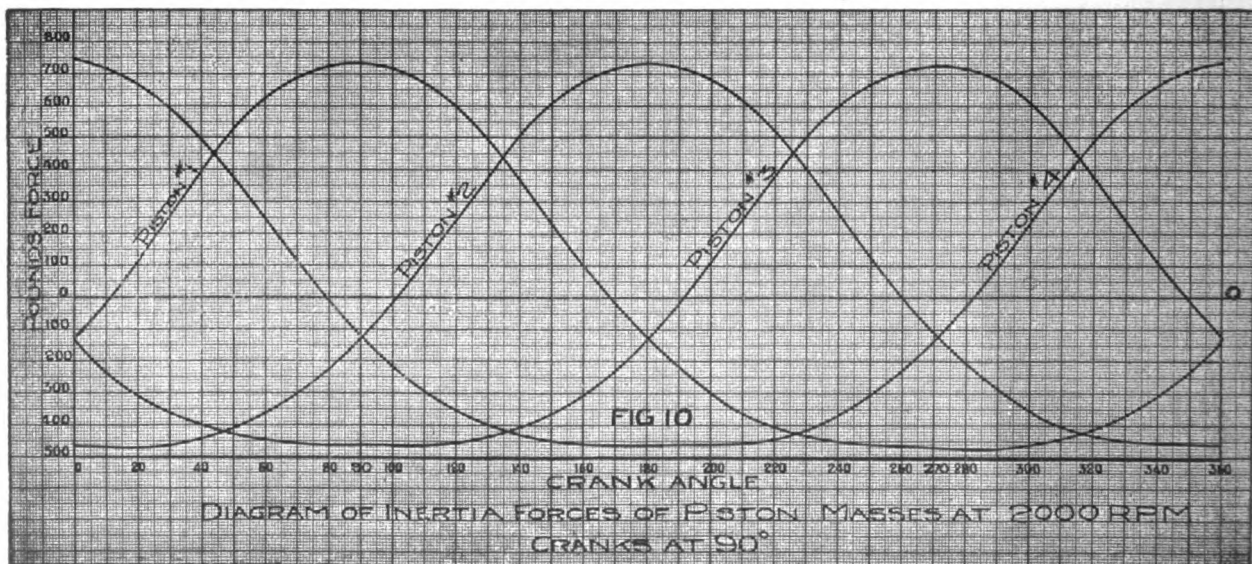
The longer the connecting rod the less will be the variation "X," but the amount that this variation can be reduced is very slight unless the connecting rod is impractically long. The limit of length is determined by the rigidity sought. The longer we make the connecting rod, the more substantial it must be to give the same rigidity as a connecting rod of shorter length, and then weight becomes a factor to be considered.

So far as the influence of inertia on bearing wear is concerned, this will be the same whether it is a four, six, eight or twin-six engine, if the masses are equal, as the influence of inertia, or the accelerating force of the pistons on the crankpin, is independent of the balance of the masses as a whole.

The main bearing loads set up by the centrifugal effect of the crank pins and connecting rod bearings is quite appreciable. In order to reduce these to an absolute minimum a counter-balanced crankshaft is used in all of our engines.

The counter-balances as shown in plate 13 are effective because they counteract the effect of the centrifugal forces, and incidentally the balancing of the revolving masses as nearly as possible in the planes of rotation also has a remarkable steadying effect on the shaft as a whole, and eliminates to a marked degree local distortion of the shaft, thus preventing the periodic tremors that often exist as a result of this local deformation.

As a means of comparison of the bearing pressures due to the influence of inertia and explosion forces, refer to table No. 7. It will be seen that actually in the eight-cylinder engine we have relatively less pressure on the connecting rod and main bearing.



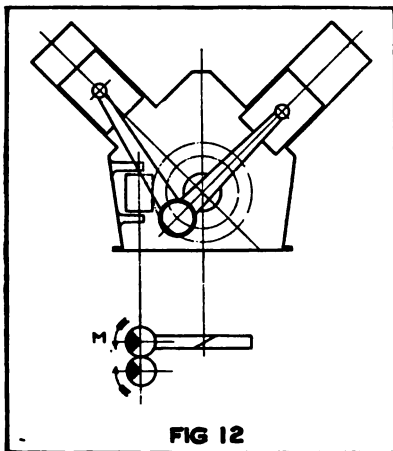


FIG 12
Lanchester Anti-Vibrator as It Can Be Applied to Eight-Cylinder Engine.

conventional eight, we have experimented with various types of crankshafts designed to eliminate it and make a "system of bodies," or a theoretically balanced system, the same as we find in the six and twin-six.

Fig. 8 shows an end view of one of the shafts in question, the crank pins being at 90 degrees to each other. This demonstrates graphically the balance of the piston masses and the reciprocating portion of the connecting rods. The angular location of the pins with respect to each other in the longitudinal plane and the effects thereof are shown later.

This illustration is made primarily to prove that an eight-cylinder V type engine is not necessarily an unbalanced system. In the drawing it will be seen that the shaft is in dead centre position. It will be observed that one piston is up and one down respectively, while two are in the position of mid-crank pin travel.

The same is true of each block and therefore the centre of gravity will coincide in each block at any instant, the arc "A" struck from the centre shaft passing through the centre of gravity "B" and "C" as shown. The centre of gravity of the pistons is indicated by the black spots in the line of piston travel. The positions "B" and "C" are midway between the centre of gravity or mid-position of the pistons "D" and "E" and the centre of gravity "F" of the other piston. Likewise, the centre of gravity of the connecting rods is indicated by the small dots on the centre line of the connecting rods as shown at "1-1."

The points "2-2" show the common centre of gravity of the rods on the same crank pin, of which point "3" is the combined centre of gravity of the whole and is common to all the connecting rods and on the vertical centre line of the motor.

The points "4-4" are the common centres of gravity of the piston masses on each crank pin, being midway between the centre of gravity on each piston, the common centre of gravity of each system being indicated at point "5," while "G" is the combined centre of gravity of the whole system and coincides with the centre of gravity of the pistons in both blocks as arrived at by the combination of the centres of gravity "B" and "C." This, therefore, is an analogous condition to that of the six-cylinder engine.

As a further illustration and as a comparison with a conventional shaft, the existing inertia and accelerating forces are again plotted as shown in curves in Fig. 9 and Fig. 10. The inertia curves being superimposed at crank periods of 90 degrees, the resultant is zero, as indicated at "0-0." This is arrived at by subtracting all the negative ordinates, or those beneath the zero line, from the positive ordinates above the zero line.

Figuratively we can arrive at the same conclusion by resolving the forces of inertia and acceleration of each piston into horizontal and vertical components. It will be seen in Fig. 8 that the piston masses "6 (1)" and "7 (1)" each have their resultant downward as the piston "6 (1)," having passed the position of maximum velocity, the energy of the piston will be doing work on the crank

The relative balance of the six and eight has been illustrated in a previous paper before this section, and though it was asserted that the eight-cylinder engine is not a balanced system, I should not say that this statement was fundamentally in accord with the most recent scientific conclusions along this line.

In the course of our experiments made as a means of determining the influence of the theoretical unbalance of the

shaft while the piston "7 (1)," not yet having reached the point of maximum velocity, is still being accelerated by the crankshaft, its reaction being, therefore, downward. Adding up the forces we get zero as a resultant, showing that there is positively no resultant unbalanced force.

The arrangement of the crank pins is shown in Fig. 14 and Fig. 15 and each exhibits different characteristics. There is not what we could term "looking glass symmetry" in the same sense that it is found in the conventional shaft with the crank pins at 180 degrees in the same plane. In other words, while the shafts are identical in each half, about an axis in the centre, so far as their structure is concerned, one-half, if placed before a mirror, would not show a true reflection of the other half. There will be, therefore, a rocking moment about a plane of symmetry at right angles to the crank axis.

In the first shaft in Fig. 14 a longitudinal couple of large magnitude does exist, due to the centrifugal effect of the crank pins and also the accelerating forces on the pistons. This would tend to rock the shaft about the centre "0-0" as shown and the magnitude is such that it cannot be balanced practicably.

In the shaft in Fig. 15, however, while there exists a small rocking moment due to the accelerating forces of the piston masses and also a rocking moment in a plane at right angles due to the centrifugal effect of the crank pins, the magnitudes of these rocking moments are very small in comparison with those in the first shaft, as can be seen from the sketch. In Fig. 15 the effects of the forces on adjacent crank pins tend to rock the shaft in opposite directions, the resultant being the difference of these moments. In the first case, on the other hand, they augment each other.

Therefore, it is entirely practicable and feasible to completely balance the centrifugal moment by the addition of balance weights on the end crank arms, as at "A," and also to eliminate the inertia moment to such an extent that its presence would not be observed under any ordinary conditions.

The firing order for the latter shaft would be 1-5, 2-6, 8-3, 7-4 or 1-3, 7-4, 8-5, 2-6, and with crank pins "3" and "4" rotated 180 degrees, the firing orders would be 1-5, 2-3, 7-4, 8-6 or 1-4, 8-3, 7-5, 2-6, which, with proper manifold design, are equally as good as the firing order of 1-8, 3-6, 4-5, 2-7, as used in the conventional shaft with the crank pins at 180 degrees.

The foregoing is sufficient to show the general characteristics of these experimental shafts as we have found them.

And our experiments demonstrated that equality of cylinder performance was of prime importance since we found that, with the unbalanced inertia forces eliminated, we could actually produce vibrations by erratic firing order when different camshafts are used and by

3½-inch bore, 4¼-inch stroke, connecting rod 2¼ S. weights:

Piston 15½ ounces
 Rings 4 ounces
 Pin and bearing.... 9½ ounces
 Reciprocating part of connecting rod.... 9 ounces

Total..... 38 ounces = 2.375 pounds.

Angle X	Angle factor	Crank I. at 1000 R. P. M.	Crank I. at 2000 R. P. M.
0	1.235	186.2	747
10	1.206	182	729
20	1.12	169	677
30	.984	149.5	595
40	.807	122.8	512
50	.602	91.5	376
60	.382	48.1	193
70	.162	24.6	98.5
80	-.047	7.15	28.7
90	-.235	35.7	-143
100	-.395	60	-240
110	-.522	79.4	-318
120	-.618	94	-378
130	-.684	104	-416
140	-.725	110	-440
150	-.748	113.7	-455
160	-.760	115.5	-462
170	-.764	116.2	-466
180	-.765	116.3	-467

Table No. 11—Referred to on Page 38.

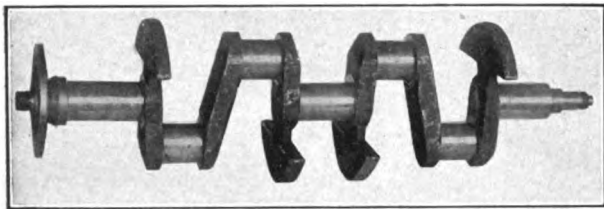


Fig. 13—The Cole Eight Counter-Balanced Crankshaft.

purposely creating a condition of unequal cylinder performance.

The general conclusions drawn from these tests are that the theoretically unbalanced forces do not offer such objectionable vibrations as those which may be produced from other sources. This led us to assume that the vibration of the kind arising from the elastic yielding of the parts of the engine are far more serious.

If the vibrations due to the theoretical unbalance of the eight with the conventional crankshaft were perceivable or objectionable to the same extent as the critical vibrations of the six and twin-six, corresponding means could be employed to correct them.

Fig. 12 shows the "Lanchester Anti-Vibrator," as it can be applied to the eight-cylinder engine, which in effect supplies a countervailing movement of a mass of the same periodicity and opposite in direction to the unbalanced force in the engine. The masses "M," revolving in opposite directions, neutralize each other in all but the horizontal plane where the combined centrifugal forces equal the vibratory force in the horizontal plane.

It will be observed that with a greater number of cylinders it would be harder to obtain equality of cylinder performance. Particularly is this true where the individual cylinder displacement is very small, because the little variation which occurs either from the differences in valve timing or tappet clearances and manifold designs will have a greater effect than with the same variations on a larger cylinder displacement.

In respect to rigidity the eight is most certainly superior to any other combination. The crankshaft is exceptionally stiff and although the explosive forces in the cylinder of $3\frac{1}{2}$ -inch bore exceed those in a three-inch bore, the great reduction in length and lesser distance between the supports give greater rigidity and consequently less deflection than does a longer shaft even though the pressure imposed upon it be somewhat smaller.

In the eight-cylinder Cole-Northway V type engine the shaft is $2\frac{1}{4}$ inches in diameter and the length between centre of supports $10\frac{3}{4}$ inches.

The crank case, common to any type of engine if it is exceptionally long, is subject to the same criticism, and for that reason the eight in this respect is all that could be desired because the case is short.

Actual performance proves the importance of this stiffness, characteristic of the eight, to be an essential to durability and smoothness in the operation of the engine.

Periodic vibrations at critical speeds in a six-cylinder engine have been attributed to the synchronism of the torsional oscillations of the crankshaft, due to the impulses and the natural vibration period of the shaft itself.

This was treated in a previous paper before this section, but while it was pointed out that the decreased length of the shaft of the twin-six would be a factor tending to reduce this periodic vibration, it is logical that the critical period in the twin-six will be just as pronounced. By shortening the shaft the periodicity or natural period of the shaft will be higher. But the explosive impulses are also closer together. In other words, the torsional frequency is higher, and since both the natural period and the explosive impulses are higher, the time when the periods will coincide and give a critical vibration will be the same irrespective of the fact that with a light piston and small explosive pressure there will be a decreased twist on the shaft.

If the natural period were of a higher frequency and the torsional period due to impulse had remained as in the six, it is possible that the time of synchronism would not have been within the speed range of the engine. This is precisely the condition that an effort was made to attain in the six by using a big, heavy shaft.

Therefore, the same difficulties and disadvantages can be argued against the twin-six as are characteristic of the six, since many of these peculiarities recur in the twin-six. They are not characteristic, however, of the eight-cylinder engine.

"MINIMUM NOISE."

By the term "minimum noise" we mean the ability of the mechanism to operate without objectionable sound. Previously we have dealt with the vibration and the noise resulting therefrom, and under this heading we will consider the noise resulting from the parts of the mechanism which come together with metallic contact due to the clearances that must naturally exist.

Since in any engine the clearances are practically the same, the noise therefrom will be substantially the same per contact. Thus, the multiplication of the parts in operation will increase the noise in the same proportion as such multiplication occurs.

Let us for a moment consider push rod clearance. It is necessary in any type of engine to have definite clearances to provide for expansion of the valves. While the weight of the push rods may vary slightly in the case of large and small bore engines, the impact caused by the acceleration of the push rods will be substantially the same and will depend upon the angle through which the camshaft moves in taking up the clearance—in other words, the back lash angle.

If the minimum specified clearance is not maintained, the noise produced is increased to a marked degree. Under these conditions the total sound made by the conglomeration of the small noises is accentuated in proportion to the multiplicity of parts. These conclusions bring forcibly into prominence the relative merits of the eight and twin-six power plants interpreted in terms of their relative simplicity and proportionate quietness.

ACCESSIBILITY.

In a recent criticism of the eight it was assumed that the accessories must, of necessity, be placed in a so-called conventional position and because the particular construction of the eight did not permit with advantage the placing of the accessories in that position, it was considered distinctly disadvantageous.

Refer to plate 18, showing the general layout of a typical V type engine. It will be observed that, though the position of the accessories is not what is purported to be the conventional one, distinct advantages are to be gained from the positions in which these accessories are placed. The position of the water pump is ideal, for it simplifies to a considerable degree the water piping in distributing the water to each block.

Because of the shortness of the cylinder block and the detachable head, which acts as a baffle, and the fact that the connecting passages are proportioned so as to give correct circulation, even temperature throughout the cylinder block is assured.

To the accessibility of the valve mechanism great importance is attached. Given a clear valve alley, as in the case of the eight-cylinder V type engine in question, it is seen in Fig. 16 and Fig. 17 that the greater amount of free space with a 90-degree construction enables more

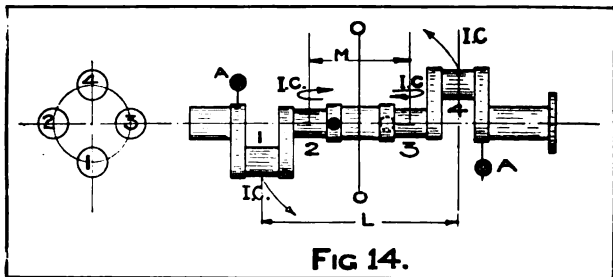


FIG 14.

The Inertia Forces on the Crank Pins Impose a Couple in the Plane "1-4" Equal to "I.-L." About "O.-O." and a Couple "I.-M." in a Plane at Right Angles; the Centrifugal Forces Impose in Addition a Couple "C.-L." in the Plane "1-4" and a couple "C.-M." in a Plane at Right Angles; the Centrifugal Couple is of Too Great a Magnitude to Permit Complete Balance by the Addition of Balance Masses at "A," While the Inertia Couple Could Not Be Balanced at All.

easy manipulation of tools than with the 60-degree construction of the twin-six. Incidentally, the case with which the push rods can be moved will be noticed in the cross-section illustration of this engine—Fig. 16.

TURNING RADIUS.

In Fig. 8 is shown the standard 30-inch wide frame, while the hood outline at the point of greatest width of the cylinders is shown, giving the minimum clearance between the engine and the hood. The taper of the hood is determined by the body width at the dash and the width of the radiator. Therefore the frame width is no greater than would be necessary with any other type of engine and the turning radius is, therefore, just as small, consistent with a 126-inch wheelbase, as would be possible with any other type of engine. The steering gear, too, offers no trouble and is equally as accessible in the eight as in the six or twin-six. As a matter of fact, the location and assembly is identical to that found in our previous models, and they were located in the chassis, according to the present standard practise.

Obviously incorrect, also, is the criticism that "in the best workouts the assembling and disassembling of the steering gear is a very difficult matter and, in most cases, at least it is necessary to remove the body and partially remove the motor in order to get the steering gear out." The position of the steering gear is fixed by the position of the wheel in its relation to the front seat and a desirable angle. This brings the gear into a definite position on the chassis and at this point the space available is just as great in the eight as it would be either in a six or twin-six engine, the stroke of the engine in each case being the same. Since this would determine the size of the crank case it is this dimension which determines the space between the crank case and the frame into which the steering gear fits.

Thus it is obvious that the construction of the eight is not disadvantageous in regard to steering gear position.

In presenting this paper we have endeavored to offer in support of our contentions the most direct and advanced engineering truths available, supplementing these with facts that have been deduced directly from what has been disclosed by actual performance. We have not drawn far-fetched conclusions and have endeavored to meet each issue frankly and have discussed each point with absolute candor.

In the light of all we have shown, therefore, we are brought necessarily to these conclusions, viewing the situation from the most advanced standpoint:

CONCLUSIONS.

The eight-cylinder engine, by its inherent virtues, offers wider and more logical commercial possibilities.

It affords greater structural economy.

It has the necessary ability and flexibility.

It possesses a higher degree of thermal efficiency, greater durability and superior simplicity.

And it combines all of these with a factor that means

more, perhaps, from a commercial standpoint than most any other—minimum maintenance cost.

Exactly in proportion to the addition of cylinders do we increase the maintenance cost of an engine. For that reason the eight is bound to establish a standard of efficiency in this respect that has not been attained with an engine of more cylinders.

Summing it all up, but one final determination is reached—the eight, with

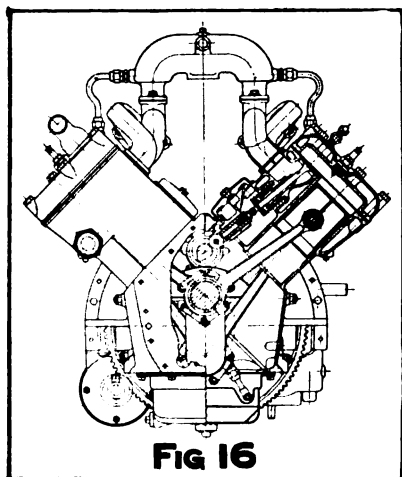


FIG 16

Illustration of Accessibility of Valve Mechanism of the Eight-Cylinder, V Type Engine.

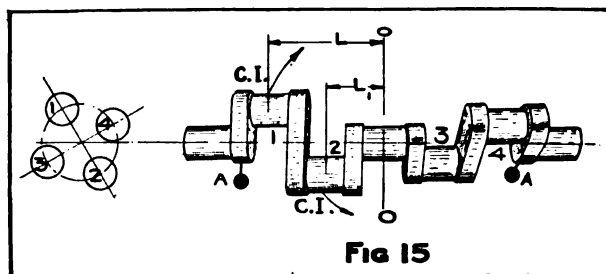


FIG 15

The Inertia Forces Exert a Moment About the Centre "O.-O." in the Plane 1-2 Equal to $(L-L_1) \cdot (I-L_1)$ and a Moment in a Plane at Right Angles of Equal Magnitude; the Centrifugal Forces Exert Similar Moments Proportional to Their Magnitude; the Magnitude of the Resultant Moment Is Such That the Centrifugal Moment Can Be Completely Balanced by the Addition of Balance Weights at "A," the Inertia Moment Being Small It Can Be Practically Eliminated by Additional Mass at "A."

its small per cent. of increase in the number of parts, brings with it a greater proportionate increase in adaptability and performance, while in the twin-six, as we have seen it, a further increase in the number of cylinders, adding only slight advantages in one respect, brings disadvantages in the other that considerably outweigh them.

In other words, the eight is not the result of an arbitrary multiplication of cylinders backed by sales argument, but not supported by the best engineering judgment. It represents an actual advance in the natural process of progression in engine building and cylinder co-ordination, and for that reason has been able to prove its superiority over any other type which has been produced thus far.

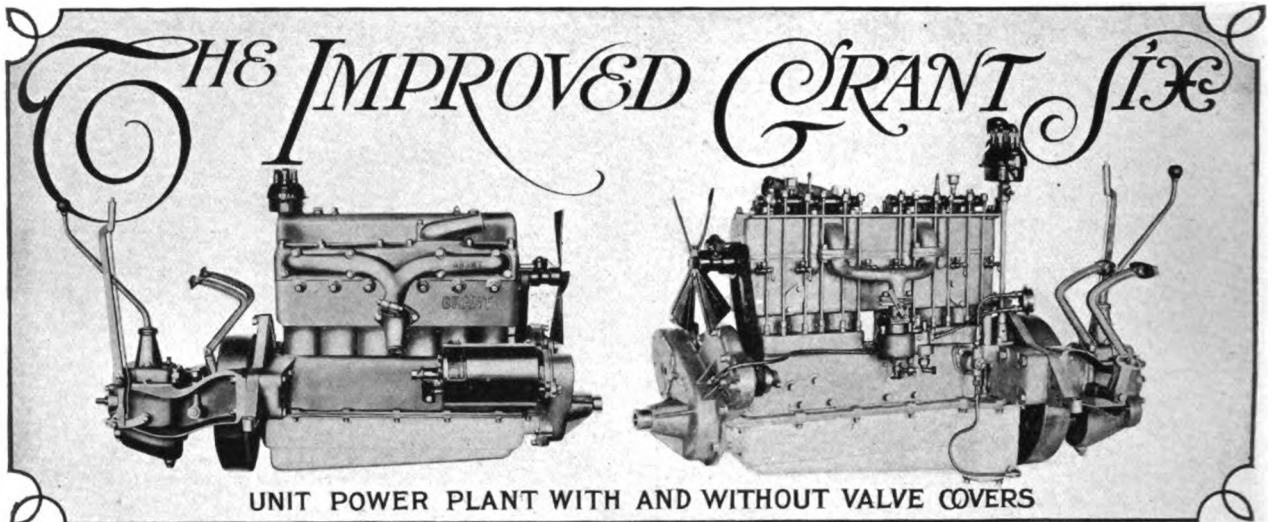
DIRECTORY OF FORD WRENCHES.

Walden Manufacturing Company Issues List of Special Wrenches for Ford Cars.

To indicate to the trade the variety of its special wrenches designed to meet the exact requirements of Ford cars the Walden Manufacturing Company, Worcester, Mass., has issued a directory of Walden Worcester wrenches.

This list is made up of items that have been carefully tried out with relation to all the nuts and working spaces on the Ford and are perfectly adapted to their uses. The wrenches are of the usual Walden quality, made of steel and machine turned with the sockets broached 1/64 inch oversize to insure a perfect fit in every case. The list is as follows:

Adjustment fan belt, 3648; bands, slow, low, brake and reverse, 4564; bearing manin, 3648; body bolts, 2228; bolts on engine, T1812 and B. S. 18; bracket nut, controller shaft, 3240; brake bands, 4564; case differential and nuts, B. S. 18—T1812; clamp stud nuts on manifold, T1812-B. S. 18; connecting rods, including fourth, 5810; controller shaft bracket nuts, 3240; cover transmission bolts, B. S. 18—T1812; crank case cover (lower cover), 3240; cylinder head bolts, 3240—T2012-B. S. 20; dashboard nuts, T2012; differential case nut studs, B. S. 18—T1812; differential drive gear cap screw, 3240; drive shaft housing stud nuts, 3240—T2012; drive shaft pinion, 01516; engine bolts, B. S. 18—T1812; fan bracket bolt, 3648; housing bolts, rear axle, 3240; housing stud nuts, drive shaft, 3240—T2012; hub bolt nuts, 2228; intake water screw, 3240—T2012; universal joints, B. S. 18—T1812; lower cover crank case, 3240; main bearing bolt, 3648; manifold clamp stud nuts, T1812-B. S. 18; outlet water cap screw, 3240—T2012; pinion drive shaft, 01516; rear axle housing nuts, 3240; reverse bands, 4564; slow speed bands, 4564; spindle arm nuts, 2228; spindle bolt and nut, 3648; spindle connecting rod bolt, 3648; transmission cover nut, B. S. 18—T1812.



TO INTRENCH itself in the larger light car field the Grant Motor Company of Findlay, O., has enlarged and improved the Grant "Six" of the past season, although it is selling it at the same price.

The most important changes are the increase in the motor cylinder bore from $2\frac{7}{8}$ to three inches, and six inches are added to the wheel-base, making this 112 inches. This lengthens the body considerably and the car throughout to be better proportioned.

Although these changes make a larger and better car, the price has been maintained at \$795 with complete equipment. Improved manufacturing practise and a larger volume of business

makes possible the larger car at the same price.

The most noticeable feature of the car is the new body design. This is a modification of the boat effect, which has been given popular approval. The sides have been raised somewhat and the cowl brought up higher, with very little difference between the slope of the hood and the front of the car.

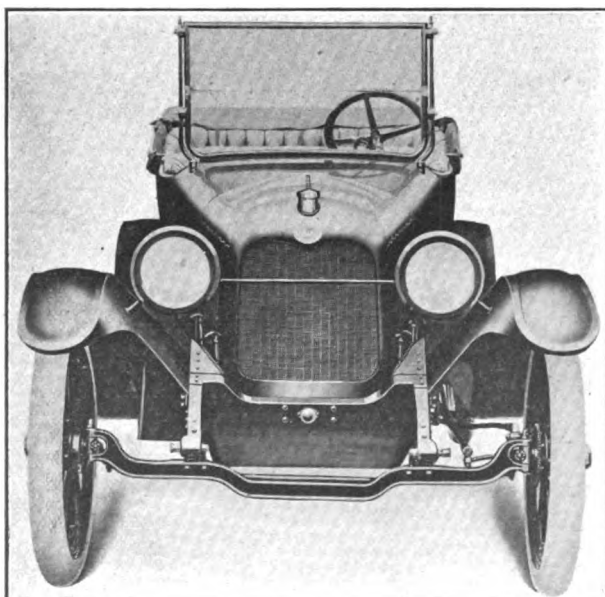
Single-Unit Power Plant.

The single-unit power plant has cylinders having bore of three inches and stroke of $4\frac{1}{4}$ inches. This rates the engine at 21.6 horsepower, but the brake horsepower developed is much larger. The piston displacement is 180.2 inches. The engine is expected to produce fully 10 per cent. more power than the 165.5 cubic inch displacement engine of the 1915 cars. It is an overhead valve type with the valve rods on the left side.

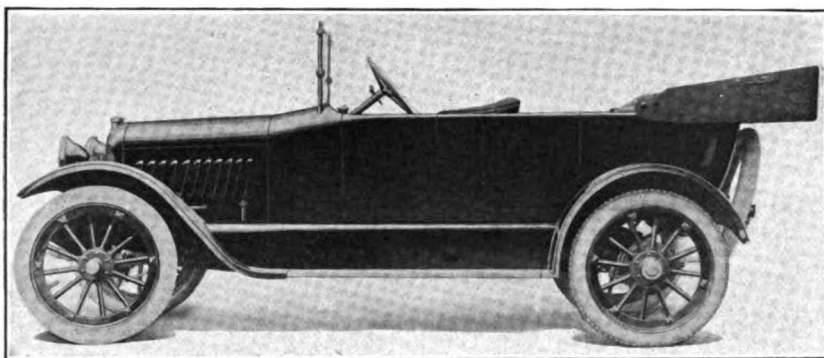
The valve rocker mechanism is completely housed by a cover at the top of the engine so that only the lower ends of the valve rods are visible.

The cylinder head carrying the valves and rocker arms, water outlet connection and manifold, is detachable from the main cylinder block, which is in unit with the upper part of the crankcase. The exhaust manifold is a separate casting bolted to the right side of the head, but at the right side there are two openings in the block for a two-branch intake manifold. The distribution passages are cored within the head casting.

There is an improvement in the valve mechanism that adds much to its accessibility. Roller tappets are used instead of the mushroom head type formerly employed. The cams contact with the rollers and all side thrust is eliminated. This reduces wear and tends to eliminate noise. The



Front View of Grant Six, Showing Graceful Body Lines.



The Five-Passenger Grant Six-Cylinder Model for 1916.

tappets are so assembled that they can be removed without taking off the crank case. The tappets are bushed and there is no chance of oil leaking past them. The three-bearing crankshaft is rigidly mounted in the upper half of the crank case.

Allis-Chalmers Generator.

The motor generator of the Allis-Chalmers single-unit starting and lighting system is placed at the right side of the motor, at the front. It is driven by a silent chain. The storage battery is 80 ampere-hours capacity and it is carried in a steel basket under the right running board splashers. This makes only very short wiring necessary. The installation is six volts and is a grounded return type.

An entirely new radiator is used for the thermo-syphon cooling system. The outer shell of the radiator is attached to the frame of the car and supports the inner core. Thus any weaving of the frame cannot affect the radiator. There are large inlet and outlet manifolds to insure free circulation of the water.

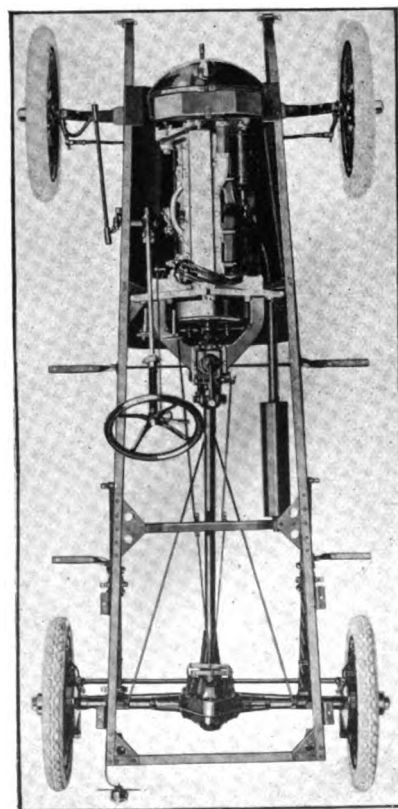
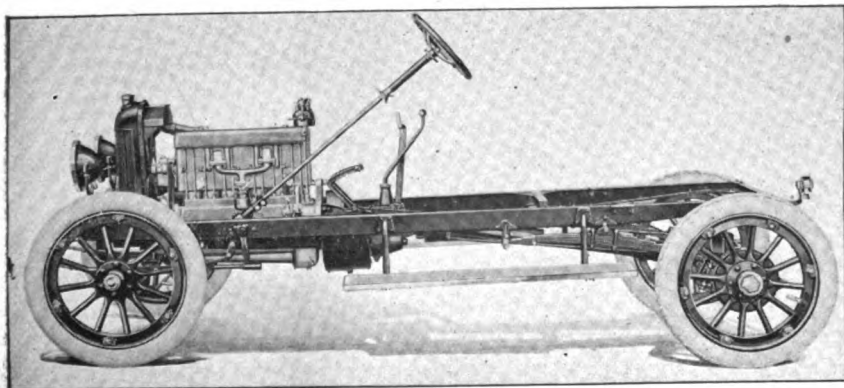
The gasoline tank under the cowl has been enlarged by two gallons. It feeds to a Rayfield carburetor, which is mounted fairly high on the left

side of the motor, by gravity. The carburetor is water jacketed. The oiling system is a combination force feed and splash type, circulated by a pump through a gauge on the dash.

An Atwater Kent ignition system is used and there is an improvement in it called a polarity switch. This prevents fusing or corroding of the timer. The distributor is on the left side of the engine and is driven by a vertical shaft.

The gear box is bolted to the rear of the crankshaft by a yoke construction. There are three speeds forward and reverse. The flywheel is open and the arms of the yoke pass around it and are bolted to the gear box. A ball bearing, throw-out mechanism has been added to the leather faced cone clutch, which makes it handle better, lessening wear and making lubrication of the bearing surfaces easier.

The transmission gearset shafting is carried on a n n u l a r ball bearings. Centre control with swivel lever is used. The torsion tube which encloses the propeller shaft is solidly mounted behind the u n i v e r s a l joint and has



Two Views of Chassis of Grant Six, One Feature of Which Is the Yoke Support of Forward End of the Drive Shaft and the Gear Box.

brace rods running diagonally back to the outer ends of the axle tubes.

Full-Floating Rear Axle.

The rear axle is a full-floating type, adjustable; and with the differential and pinion in one carrier as is common practise. Ball and roller bearings carry the shafting and there is an unusually large plate at the rear to make the differential easily accessible. The gear ratio is $4\frac{1}{2}$ to one. The brake areas have been enlarged by widening the drums.

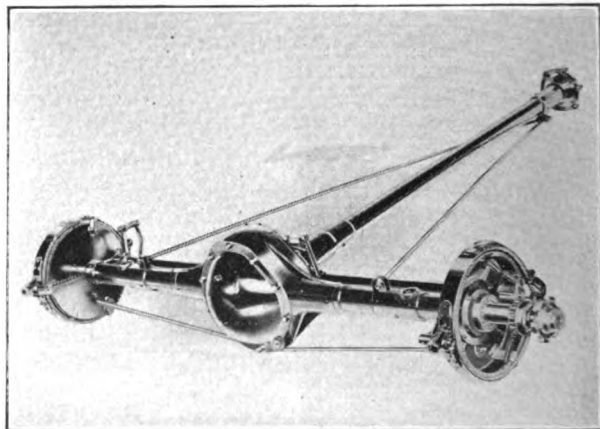
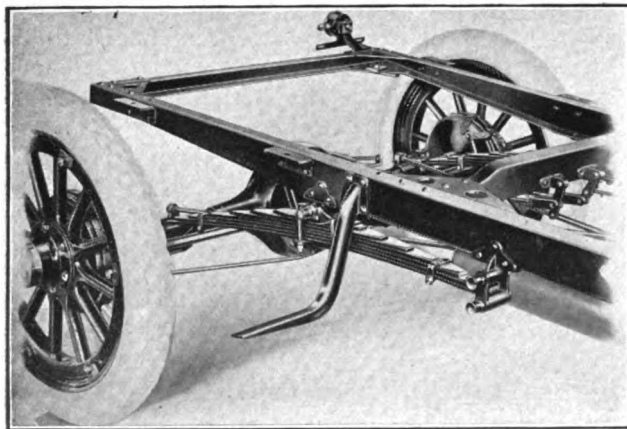
The rear springs are full cantilever, with the centres trunnioned to the under side of the frame rails and with the front ends shackled to them. A considerable taper is given the frame from rear to front to provide a short turning radius.

The windshield is a new type with a curved base, which is attached directly to the cowl with

owners. These tires average 9974 in mileage and some of them run to nearly 30,000 miles. The company declares that all Goodyear tires do not give such results as these, but cites the mileages to show what Goodyear tires can do when they are well taken care of and used under favorable conditions.

OMAHA SHOW ASSOCIATION ELECTS.

Officers for the coming year were recently elected at the annual meeting of the Omaha Automobile Show Association, Inc. The directors chosen were Clark G. Powell, Guy L. Smith, J. T. Stewart, 2nd., George Reim and C. L. Gould. Of the directors the following were chosen to serve as officers: J. T. Stewart, president; Guy L. Smith, vice president; Clarke G. Powell, secre-



Rear Axle and Drive Shaft Construction of the Grant Six, and at Left the Distinctive Means of Pivoting Rear Springs Under the Frame.

no filler board. Firestone demountable rims are used with 32 by $3\frac{1}{2}$ -inch tires all around, and non-skid treads on the rear.

The instruments are neatly grouped on a board and a dash lamp provided to illuminate them. In the electrical unit group are the polarity switch, ammeter, the electric regulator and the fuses. All of the electrical equipment is thus controlled from one point. The car is handsomer than before. This year's standard colors are a Brewster green body with black fenders, running gear and wheels.

1000 UNUSUAL TIRE RECORDS.

A booklet has been issued by the Goodyear Tire and Rubber Company in which 1000 exceptional mileage records with Goodyear tires are cited with the names and addresses of the tire

tary and treasurer. The dates set for the 1916 show were Feb. 21 to 26 inclusive.

COMING EVENTS.

November.

- Nov. 12-20—Show, Providence, R. I.
- Nov. 18—Race, 150-mile Grand Prix, Arizona.
- Nov. 20—Road race, Carona, Cal.
- Nov. 29-Dec. 4—Electric Prosperity Week.

January.

- Jan. 1-8—Show, New York City.
- Jan. 8-15—Show, Philadelphia.
- Jan. 8-15—Show, Cleveland, O.
- Jan. 22-29—Show, Chicago.
- Jan. 24-29—Show, Buffalo.
- Jan. 29-Feb. 5—Show, Minneapolis, Minn.

February.

- Feb. 7-12—Show, Kansas City, Mo.
- Feb. 14-19—Show, Des Moines, Ia.
- Feb. 19—Show, Newark, N. J.
- Feb. 21-26—Show, Omaha, Neb.
- Feb. 21-26—Show, Syracuse, N. Y.
- Feb. 29-March 4—Show, Fort Dodge, Ia.

March.

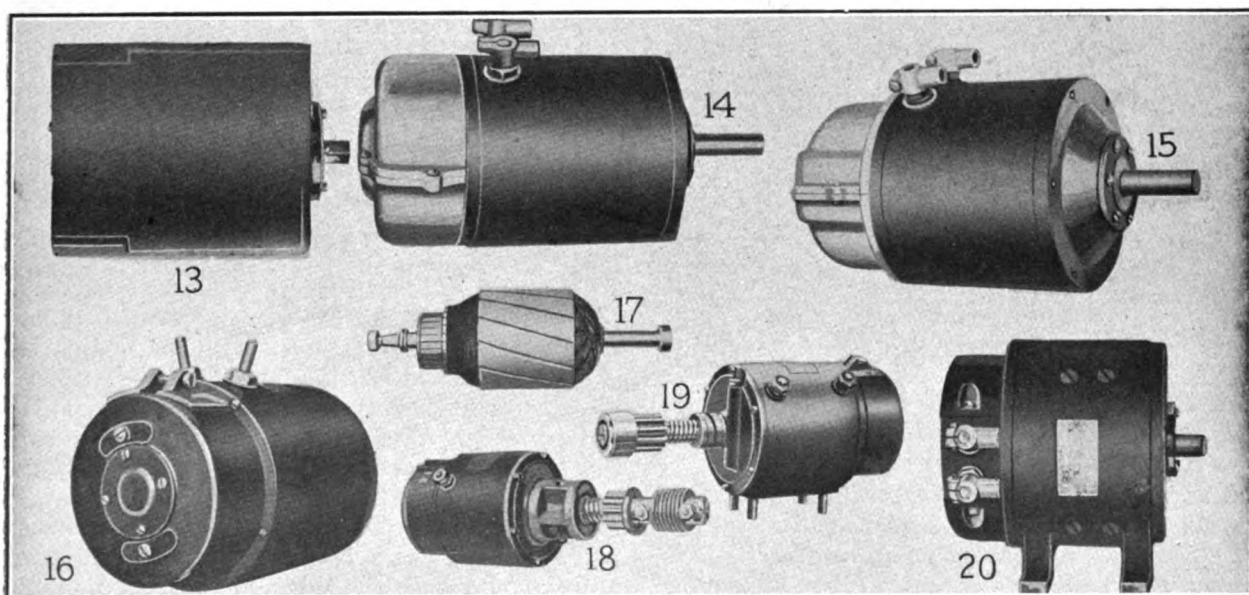
- March 4-11—Show, Boston, Mass.

MOTOR STARTING AND CAR LIGHTING.

The Two-Unit Remy Systems, with and without Ignition Equipment—The Means of Coupling to the Engines and the Methods of Regulation and Operation.

A SECOND two-unit system consists of model 166 ignition-generator and model 114 starting motor. With this the ignition-generator unit includes a generator, distributor, coil and reverse current relay, which may be driven from the timing gearset by gears or chain, or by an outside shaft. The starting motor is designed for location at the rear of the engine and to be coupled with a Bendix drive to an external ring gear on the periphery of the flywheel. This particular system was developed for use with Oakland cars and it cannot be used with any other unless the engine is designed for its installation.

slightly spiralled and the windings are heavy copper wire, first enamelled and covered with two thicknesses of cotton fabric. The windings are impregnated with a special heat-resisting varnish, which is baked. This construction insures thorough resistance to vibration, heat and moisture. The commutator segments are large and are molded in a strong insulating compound. The armature is mounted on a steel shaft and is carefully balanced. The brushes are a copper-carbon composition. The positive and the field brushes are insulated from the metal rocker ring, while the negative line brush is connected to it.



Remy Starting Motors: 13, Model 9 Motor; 14, Model 4 Motor; 15, Model 5 Motor; 16, Model 81 Motor; 17, Slotted Drum Type Generator Armature; 18, Model 114 Motor; 19, Standard Type Motor; 20, Model 6 Motor.

This ignition generator is a low-speed, four-pole, shunt-wound type, with maximum capacity of six volts, which is driven at $1\frac{1}{2}$ times crankshaft speed. The maximum production of current is obtained early and is continuous thereafter at all speeds. The control is automatic by a vibrating type of regulator. The generator is enclosed in a cylindrical steel case, the armature being carried on large annular ball bearings mounted in the end plates. The armature is a slotted drum construction with the channels

The circuit from the battery to the negative brush is through the frame of the generator and the engine.

The System of Ignition.

The ignition-distributor includes both the distributor and the circuit breaker and is extremely simple in design and unusually accessible. The number of moving parts is very small, the bearing for the rotating shaft is extra large size, and provision is made for lubricating this bearing by a wick oiler. The contact points are larger than

are ordinarily used. The high-tension current is distributed to the spark plug cables by a segment which revolves close to but does not touch the pins in the distributor head. The weight of the breaker arm is small and the action is very fast and smooth. The contact points of the circuit breaker are silver and are very large. Because of the reversal of the current through these the life is unusually long.

The reverse current relay and the regulator are combined in one unit for this generator. This is mounted on a bakelite base. The relay consists of an electro-magnet, an arm that is mounted on hardened bronze pivots and two platinum contact points. When the engine is running at a speed below which voltage can be generated, or is not in operation, a spring holds the contact points apart. When the voltage of the generator reaches the value of that of the battery, the cur-

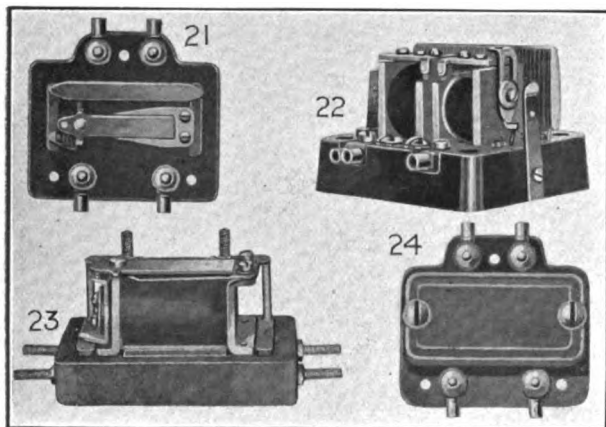
rent flows through these points. When the speed of the generator is such that its voltage would be above the predetermined maximum, the charging current, which is flowing through the coil of the electro-magnet, energizes the coil and the arm is drawn down. This separates the contact points and the field current, which has passed through the points, is then compelled to pass through the resistance unit. The resistance decreases the field current, which in turn decreases the current production of the generator. This reduces the energizing effect upon the electro-magnet, and the spring forces the contact points together, cutting out the resistance in the field current. The generator current will start to build up and the operation will be repeated. This continuous repetition of the regulator will send a pulsating current to the generator field and maintains the current produced by the generator at practically a constant value. There is a fuse installed in the relay-regulator base to protect the generator should the battery become disconnected while the generator is in operation.

The coil that is used with this unit is designed to operate satisfactorily with a current as low as $2\frac{1}{2}$ volts. The windings are protected with bakelite and a heavy coating of insulating compound. With the purpose of minimizing the current consumption of the coil there is an external resistance placed in series with the primary winding that is located on the top of the coil.

The Model 114 Starting Motor.

The model 114 starting motor is a four-pole, series-wound type, that is enclosed in a cylindrical steel case, with end plates bolted on, the whole assembly being water and dust tight. This is rated for six volts pressure and has capacity to turn the engine with a minimum consumption of current. In general it has the same characteristics of design and construction as those previously described. The armature is carried on very large annular ball bearings and the commutator and brushes are designed to carry heavy current load without damage. The brushes are copper gauze.

The pinion end of the armature shaft is fitted with the Eclipse-Bendix automatic transmission, so-called. The shaft is carried on heavy annular ball bearings and on the extension of the pinion end is a hardened steel sleeve upon which is cut a triple worm gear. Operating upon this sleeve is a hardened steel pinion having a lateral travel of about $1\frac{1}{2}$ inches. A helical spring of high-grade steel connects with a pin in the outer end of the sleeve and to a pin through the outer end of the armature shaft, this serving to cushion the



Regulating Devices: 21, Model 62 Reverse Current Relay with Cover Removed; 22, Model 60 Relay Regulator with Cover Removed; 23, Reverse Current Relay; 24, Model 62 Reverse Current Relay with Cover In Place.

rent flowing through the shunt coil of the electro-magnet energizes it and the arm is drawn down, this bringing the contact points together. The contact points are held in this position so long as the voltage of the generator exceeds that of the battery, but when the voltage of the generator falls below that of the battery the spring forces the point apart and the charging circuit is broken.

The Method of Regulation.

The regulator consists of an electro-magnet, an arm operating on two hardened bronze pivots, two sets of contact points, two of which are mounted upon springs, and a resistance unit. When the generator is running at a speed lower than that required for maximum current production, the regulator contact points are held together by a spring under the arm and the current supplied to the generator field passes directly

pinion shocks when starting the engine.

When the current is sent to the motor, the armature, being free, begins to turn, and the pinion, because of inertia, does not revolve and is drawn by the worm along the sleeve and into mesh with the external gear in the periphery of the flywheel. When the engine is running the increasing speed of the flywheel will cause the pinion to be turned backward on the worm of the sleeve until it is disengaged. In this manner a large starting torque is obtained by bringing the pinion into mesh while the motor is operating.

Second Two-Unit System.

Another two-unit combination consists of a slow-speed, four-pole, shunt-wound, six-volt generator, with which is assembled an ignition-distributor, a coil and a combination relay-regulator and a six-volt, series-wound, starting motor. The generator is contained in a cylindrical steel housing that has a flat base for convenience in mounting. This machine may be driven by gears or chain from the timing gearset, or by an outside shaft as the design of the engine may require.

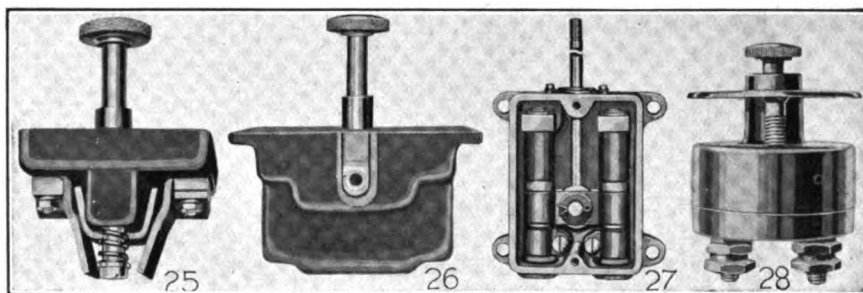
The ends of the housing are covered with plates in which are mounted the large annular ball bearings, the case being water and dust tight when assembled. The armature is a slotted drum wound construction, with the channels spiralled to minimize heating and obtain noiseless operation. The armature windings are of enamelled wire that is shaped on forms and is covered by two thicknesses of cotton fabric. It is thoroughly insulated with a heat-resisting and moisture proof compound. The field windings are shaped on forms and are similarly insulated. The commutator is heavy, of a special grade of copper molded into a solid insulation. The armature is carried on a shaft that is tapered and provision is made for securing a coupling with a nut and a Woodruff key. Much care is taken to balance the armature. The brushes are a copper-carbon compound.

Two Means of Regulation.

The means of regulation depends upon the requirements of the car in which the system is to be used. The one is the use of the combination vibrating regulator and reverse current relay, which has been described. The other is the inherent regulation by a third brush. With either of these the control is automatic and with the

third brush the reverse current relay is a separate instrument. With the combination regulator-relay the protective fuse is placed in the bakelite base of the instrument, and with the brush and relay the fuse is placed in the base of the relay frame.

The ignition distributor unit includes both the distributor and the circuit breaker, and it is very simply designed and is unusually accessible. The distributor cap is bakelite and its construction is such that advancing and retarding the spark does not move it, this protecting the high-tension cable. The circuit breaker has points of an alloy of platinum and iridium that are very enduring. The gearing is wholly enclosed within the housing and special attention has been directed toward obtaining quietness and accuracy of operation. The coil is designed to afford efficient ignition with $2\frac{1}{2}$ volts current. All coil windings are heavily insulated and protected, and the coil is mounted on a ventilating base



Starting Switches: 25, Model 20 Pedal Switch with Cover Removed; 26, Model 20 Starting Switch; 27, Model 22 Starting Switch with Cover Removed; 28, Model 29 Starting Switch.

that will obviate heating. No attention is necessary other than to keep the felt wick spring oil cup directly beneath the distributor head filled with vaseline. Five or six drops of oil should be applied to the ends of the motor and generator every 1000 miles, and the circuit breaker contacts should be examined occasionally, once or twice during a season, according to the use made of the machine.

Two Types of Armature Shaft.

The starting motor used with this unit is a six-volt, four-pole, series wound type, that is housed in a cylindrical case of cast steel. It is designed to have ample power and unusual endurance. The armature is a slotted drum construction that in general characteristics is similar to those described. The armature is wound with coils of enamelled copper wire, well insulated with cotton fabric and a special heat resisting varnish that is baked to thoroughly dispel all moisture. The commutator is especially large

and the copper bars are molded in an insulating compound. Mica insulation is used between the segments of the commutator. The armature is mounted on large size annular ball bearings on a steel shaft that is fitted for two installations, the first with a plain shaft for connection with the over-running clutch furnished by the maker of the car, and the second with the Bendix pinion for use with a flywheel external ring gear. With this latter type of shaft there is a large buffer spring that is placed next the motor bearing to absorb the shock. There is a friction free wheel incorporated with the pinion to prevent its rebound when it strikes the pin in the armature shaft on the outward movement.

These systems do not include the motors specially designed to meet the requirements of car manufacturers, but generally are the recognized standards of Remy construction. While the special motors may differ in some details, they all have the same characteristics.

The starting switches used with these systems are either pull or push types that are adapted for the special needs of car design. They are all heavily built, the contacts having large capacity and being made from copper of low resistance and high conductivity. The switches are intended to be very enduring in hard service and to require no attention or adjustment. They may be installed to best convenience the car driver. Several of the types are shown.

(To Be Continued.)

GASOLINE PRICES CLIMB.

The great demand for gasoline is forcing a steady increase in price in all parts of the country. Recently in three days the price in New York went up as many cents. It is now selling at 23 cents retail. In Minneapolis and St. Paul it has gone from 11½ to 12½ cents.

Several plants for the manufacture of gasoline from natural gas are soon to be built in Texas. It is also announced that the large American steel companies, which formerly did not reclaim the benzol produced by their coke ovens, have been putting in equipment for the purpose.

Since the war began the American output of benzol is said to have increased from 3,000,000 to 15,000,000 gallons and still further increases are expected. It is claimed that benzol can be sold for use in motors as cheaply as gasoline as soon as large scale production is established and this, naturally, will have a steady effect on the gasoline market.

KING EIGHT REDUCES PRICE.

The King Motor Car Company, Detroit, has announced a reduction in price of its eight-cylinder car amounting to \$200. The car will now sell for \$1150 f. o. b. Detroit. The new car has a larger motor than the one announced a year ago, which was the first moderate priced six on the American market. Bore is 2⅞ inches and stroke five inches. Other changes include a larger carburetor, refinements in lubrication, radiation and ignition systems.

The car on the whole is similar to the first King eight, but a year's experience has suggested a few beneficial changes. The color of the body has been changed from blue to salon green, with black fenders, running gear and wheels.

The company recently announced an addition of 70,000 square feet of floor space to its manufacturing department. More King eights have been made and sold than any other eight-cylinder car but one and the volume of business was sufficient to give the company choice ground floor space at both the New York and Chicago shows. The company has caught up with its orders and is able to give customers immediate delivery.

MAGNETIC GEAR SHIFT LITERATURE.

"The Next Big Improvement in Automobiles" is the title of a thorough, well written and well printed booklet issued by the Cutler-Hammer Manufacturing Company of Milwaukee to place before the public its magnetic gear shift for the ordinary gasoline automobile.

The magnetic gear shift by which gears are shifted by pressing a button is compared to the electric self-starter which suddenly appeared before the public three years ago. The book tells the motorist that the electric gear shift is coming and that if he does not get it on his car it will be as out of date in a short time as were the old cars with the hand crank after the electric self-starter had arrived.

It dwells on the difficulties of gear shifting with a lever and pictures the car of the future as having no levers in the front compartment. The magnetic gear shift makes it possible to select before hand the gear in which the car is to go, so that if it is necessary to shift on a hill where all attention is needed in driving, the eyes can be kept on the road and the shift made simply by pressing the clutch pedal.

STUTZ IS SEASON'S CHAMPION.

Great American Car Wins 1915 Honors by a Sensational Margin with Two of Its Drivers, Cooper and Anderson, Also Leading.

FROM every point of view the 1915 American racing season was an astounding success. Speeds that were thought impossible a year ago



Earl Cooper, Track and Road Champion for 1915.

were made by cars one-third smaller than those of last year. Tracks were enormously improved, attendance broke all records, accidents were few, and most satisfactory of all to followers of the sport, an American car, the Stutz, with American drivers, won the cham-

pionship over all comers in the most decisive fashion.

The Stutz cars maintained their supremacy in both branches of the sport, road racing and track racing. They started 38 times in speedway and road races. Of these starts 18 were on roads and 20 on tracks. They won six first positions, 10 seconds, one third, three fourths, one fifth, one sixth and one seventh, netting a total score by the Mason point system of 121 $\frac{1}{4}$.

The extent of the triumph is realized from the statement that the second car, the Maxwell, another American product, driven by American drivers, scored 70 $\frac{1}{2}$ points, and the third, Duesenberg, American also, scored 65 $\frac{3}{4}$. The first foreign cars in the list are the Peugeots, which made 49 $\frac{3}{4}$ points, while Mercers made 23

and the Mercedes made a total of 12 points.

Figuring their performances by the same system, Earl Cooper, the leader among the Stutz

HOW THE SIX LEADING CARS FINISHED.

(Under) the system by which the champion car and the champion drivers are picked in this review, 10 points is allowed for a first, six for a second, four for a third, three for a fourth, two for a fifth, one for a sixth, seven-eighths for a seventh, three-quarters for an eighth and one-half for a 10th. The number of times a car failed to place is subtracted from the total points scored.

Positions	Stutz	Maxwell	Duesenberg	Peugeot	Mercer	Mercedes
First.....	6	5	2	4	2	1
Second....	10	3	3	2		
Third.....	1	2	7		4	
Fourth....	3	1	2	2	1	2
Fifth.....	1	2	3	1		
Sixth.....	1		1	1	1	
Seventh...	1	1	2			
Eighth....			2	1		
Ninth.....			1			
Tenth.....						
Unplaced	15	14	17	12	11	4
Points...	121	70	65	49	29	12

drivers, is both road and track champion, with 51 points. Anderson, his team mate, with 38 points, is tied for second place with O'Donnell. Resta is fourth with 33 points, and Rickenbacher fifth with 31.

While Stutz cars have been conspicuous and successful in racing since 1911, and in 1913, with Cooper up, won the road racing championship, the cars with which the remarkable record of this year were made were of entirely new design.



Gilbert Anderson, Second Among the Season's Winners, and a Champion Stutz Car.



Winner of Indianapolis Classic.

They were the first thoroughly modern racing cars that have been produced in America with long stroke, high speed engines and 16 overhead valves.

One of the most striking features of their performance was that they showed to excellent advantage in their first race—the Indianapolis classic—just after coming from the hands of their designers, and they have continued that success throughout the year without alterations in design. They defeated the best that Europe has so far produced—Peugeot, Delage, Mercedes and Sunbeam racing cars.

Whereas last year the best time was made in the Indianapolis race, where three foreign cars took the honors, the first one with a speed of 82.47 miles per hour, this year in the Astor Cup race, in which two Stutz cars finished first and second.

in the Elgin and other road races. Furthermore, the board tracks by making greatly increased speed possible and minimizing tire trouble, made it possible for the drivers to force their cars to the limit of the endurance of their engines and supplied a more severe mechanical test than had ever before been possible.

Indeed, it was to the stamina of their engines, and their ability not only to reach a great speed, but to maintain it hour after hour, that the Stutz cars owe practically all of their success.

This was most vividly illustrated in the Astor Cup race, when after other cars had shown great speed for short distances the Stutz kept on at an even, though very fast, pace to the end of the race, while other cars went out with engine trouble. They won largely by virtue of a more perfect lubrication system and more efficient cooling—features which are the vitals of any motor and especially a racing motor. They proved in fact that American engineers, and especially

the makers of the Wisconsin motor, with which Stutz cars are equipped, are better at the fine points of design than the Europeans, to whom from the beginning of the industry they have gone for construction principles.

A review of all the season's races shows, among other signs of great health

and vitality for the sport, the fact that there were more events of importance than in any previous year. There were 22 contests in road and speedway this year as compared to 17 in 1914, and 18 in 1913. With the great investment in tracks which has characterized the year, it is certain that the next season

RECORDS OF THE WINNING DRIVERS.

Driver	1st	2nd	3rd	4th	5th	6th	7th	8th	Un-placed	Points
Cooper	3	3		2					3	51
Anderson	2	2	1		1	1			1	38
O'Donnell	1	2	4		2				4	38
Resta	3	1							3	33
Rickenbacher	3			1					6	31
Oldfield	2		1	1	2		1	1	4	28½
De Palma	1	1		4					4	21
Ruckstell	1		2	1					2	19
Burman	1	1		1		1		1	4	16¾
Pullen	1		2						3	15
Mulford	1								5	5

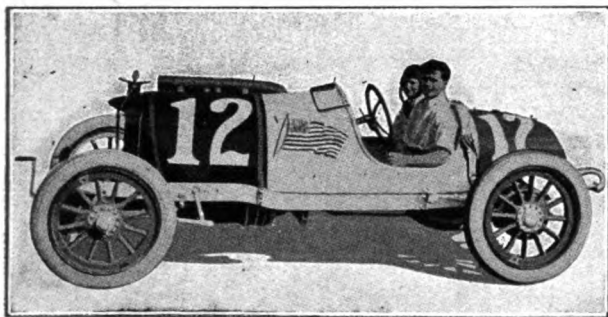
the speed was 102.59 miles per hour. This is a reasonably fair comparison of this year's races with those of last year, taking into consideration the improvement in tracks as well as the improvement in cars.

The construction of board speedways, of which those in Chicago and New York are the chief examples, played a very large part in making the speeds attained this year so very much larger than previously. Their design is such that it is safe to drive a car on them at a speed that could never before be attained on a curved track. They also are much easier on tires than the tracks that have previously been used.

But this accounts only partly for the improved performances of the cars, as shown by the fact that increases were made



Dario Resta in the Peugeot with Which He Won Three Firsts.



Deussenberg, Third Among the Winning Cars.

will see even more races.

Among the new tracks that were used for the first time this year are those at Sheepshead bay, Chicago, Omaha, Des Moines, Twin Cities and Providence. If all the plans that have been announced are carried through most of the cities of considerable size in this country will have tracks. These include Detroit, Cleveland, Pittsburg, Cincinnati, Louisville and New Orleans. All of the new tracks opened give promise of being successful.

The average speeds in the 1915 races were nine miles an hour faster than last year. This year the total average speed was 74.86 miles per hour, while in 1914 it was 65.20, and in 1913 55.75.

There were only three contests during the year in which the time of last season was not bettered. These were the Vanderbilt Cup and Grand Prize on the Pacific Coast early in the year, when the heavy track made the going slow, and the race on the two-mile gumbo track at Sioux City, which was in bad shape for racing. In all other races last year's time was bettered.

In the speedway races, not including those at Providence and Tacoma, where the time was held down by adverse conditions, the average for the year was 89.41.

Up to this time road racing has been the characteristic form of the sport in America, but the past season has shown clearly that it is coming to an end and is being replaced by speedway racing. This is evident in the fact that so many new speedways have been built and that the races at those courses command the largest proportion of the racing public's attention.

During the past year 12 road races were sanctioned, but three of these attracted only home

talent. The remaining nine rank among the less important events of the racing year.

There are many reasons for this. One is that it is difficult to exclude the public from the use of the roads while a race is in progress. Another is that roads are always more or less dangerous at high speeds and accidents are frequent at such events, which are caused chiefly by spectators eluding the police and getting on the course in spite of the best efforts to keep them off. As the roads are less perfect there is also more danger to the drivers.

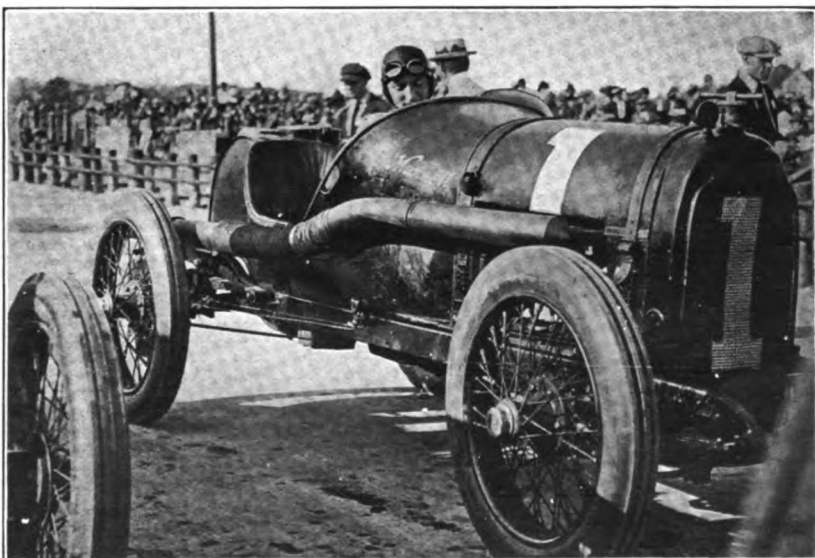
Another short coming of the road race is that it is impossible to enclose more than a short part of the course near the finish line, and it is impossible therefore to collect admissions from a large part of the crowd that gathers to see such an event.

The speedway race run in a great enclosure assures a large amount of gate receipts and such receipts are necessary, because the expenses of a great speed event are very large. Road race prizes are necessarily smaller, because they must be made up by donations from clubs or individuals, while large prizes are offered on the speedways by companies who know that they will get back their value with interest in the gate receipts.

Add to this the further fact that speeds are invariably very much higher in the speedway races and the decline of road racing in favor of



Winner at Oklahoma City.



Eddie Rickenbacher, Three-Time Winner, and the Maxwell Car.



Eddie O'Donnell Tied for Second Place.

as those over which Grand Prize and the Vanderbilt Cup were run, as well as the Corona course on which Pullen made over 87 miles per hour last year, are surfaced with macadam or brick or some other similar material, and should really be classed as semi-speedways.

VALVOLINE CUP WON BY MITCHELL.

A Mitchell car, driven by J. C. Skinner, won the \$1000 Valvoline trophy Oct. 3 for making the fastest time between Sacramento and Tallac, Cal. This is the fourth time since 1910 that the Mitchell has scored a win in this long, hard trip over the Sierra. The time was three hours and 25 minutes, which is seven minutes better than the previous record made on this mountain run. One puncture and a delay of several minutes caused by running into a herd of cattle that blocked the roadway prevented the Mitchell from making the trip in quicker time.

The run was made under the direction of the Valvoline Oil Company's representatives in Sacramento, who appointed their own starters and had their own officials in Tallac to check the cars in. Competition for the honor is keen and many cars have climbed the mountains in order to win the trophy. Three times the Mitchell has lost

the newer form of the sport is seen to be inevitable.

Of the road races that were run during the past year only the two at Elgin were bona fide road races, as the American Automobile Association now interprets the term. They were run on oiled and rolled dirt roads.

Such courses

it and three times it has won it. The course is 110 miles long and 90 miles of it is in the Sierra Nevada mountains, over some rough and very steep roads. To reach the summit, 7400 feet above sea level, a car must climb a 30-mile continuous grade in which intermediate work is necessary.

One week later a Hudson stock car, which already had been driven 14,000 miles, was sent over the course under the guidance of Harry Arnold, a Hudson distributor. He beat the Mitchell record, making the distance in three hours and 22 minutes. In addition to the driver the Hudson carried two passengers and 200 pounds of sand, a load no other contesting car ever attempted.

MOTORS IN THE WAR.

The Fremdenblatt of Berlin in an article on the use of motor transport in the war declares that the French were the first to use it, sending 500 Paris motor 'buses loaded with soldiers toward the Belgian frontier the first day of the war and following it the second day with 1000 additional 'buses. In the first week of the war approximately 250,000 motor vehicles were used for military purposes, according to the paper, and of these France had 90,000, Germany 70,000, England 55,000, Austria 25,000 and Russia 10,000. Their total value is estimated at \$200,000,000.

REBUILT PASSENGER CAR TRUCKS.

Attorney-General Grant Fellows of Michigan has decided that a passenger car that has been partly turned into a truck is a truck and license fees must be paid according to the truck scale.

TABLE OF 1915 RACES.

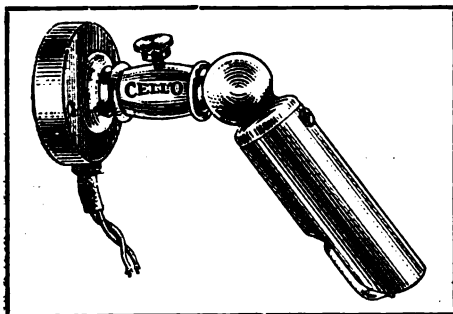
Course	Distance	Winner	Car	Time	M.P.H.
Tucson, Ariz.....	102	Clark	Stutz	1:53:13	54:05
San Diego.....	305	Cooper	Stutz	4:40:10	65:31
Elgin C. A. C.....	301	Cooper	Stutz	4:01:32	74:07
Elgin.....	301	Anderson	Stutz	3:53:25	77:25
Twin Cities.....	500	Cooper	Stutz	5:47:29	86:33
Sheepshead.....	350	Anderson	Stutz	3:24:42	102:59
Venice.....	300	Oldfield	Maxwell	4:24:09	68:30
Tucson.....	103	Oldfield	Maxwell	1:31:59	67:29
Sioux City.....	300	Rickenbacher	Maxwell	4:00:56	74:57
Providence.....	100	Rickenbacher	Maxwell	1:29:24	67:10
Omaha.....	300	Rickenbacher	Maxwell	3:17:39	91:07
Glendale.....	103	O'Donnell	Duesenberg	2:07:07	48:61
Des Moines.....	300	Mulford	Duesenberg	3:27:05	86:01
Grand Prize.....	402	Resta	Peugeot	7:07:57	56:78
Vanderbilt.....	285	Resta	Peugeot	4:27:37	66:29
Oklahoma City.....	191	Burman	Peugeot	2:56:00	68:10
Chicago.....	500	Resta	Peugeot	5:07:26	97:58
Tacoma.....	200	Pullen	Mercer	2:21:14	84:97
Tacoma.....	250	Ruckstell	Mercer	2:57:00	84:74
Indianapolis.....	500	De Palma	Mercedes	5:33:55	89:84

CAR ACCESSORIES AND EQUIPMENT.

CELLO DASH LIGHT.

Lamp for Illuminating the Dash Which Will Operate 25 Hours from One Dry Cell.

The Cello dash light illustrated herewith is neat and attractive and is produced by the A. S. Campbell Company, 284 Commercial street, Boston, Mass. One dry cell will



Cello Dash Light.

operate this light for 25 hours. The reflector is adjusted at the proper angle to cast the light to the dash. The thumb screw at the top of light serves as a switch and operates by turning, and even if the car vibrates constantly that has no tendency to loosen it. A notable feature of the construction is that a spring is used in the base of the lamp socket, which prevents any possibility of the lamp losing contact by vibration. It can be wired either through the dash or through the insulator at the base. Because of its strong construction it is unaffected by vibration and the light is particularly adapted to the Ford car. The lamp comes in one-half and 1½ candle power, and operates at six volts. If not specified when ordering, the 1½ candle power light in polished brass will be supplied. Bright black enamel finish also can be had. The lamp sells at \$1.50 each. Extra lamps retail at 35 cents each.

KNOWLSON'S SPRING LEAF SPREADER.

A Strongly Constructed Tool Which Spreads the Leaves of the Body Springs to Admit Lubricant.

To avoid the rusting of springs and the development of squeaks it is very necessary that they should occasionally be lubricated between the leaves. This is often neglected because of the jacking and other work necessary to spread the leaves. The Spring Leaf Lubricator



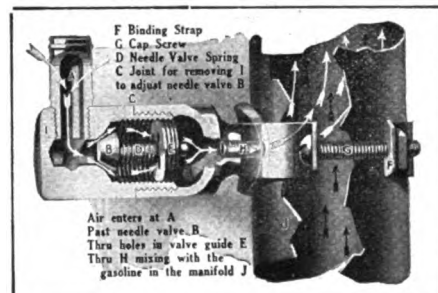
Knowlson's Spring Leaf Spreader.

is designed on the same principle as a clamp, two points being forced between the leaves by a hand screw. It is adjustable to any spring and requires no jacking to operate. The tool is drop forged and heavily nickel plated. It is shipped prepaid from the factory to any part of the United States on receipt of \$1.50. Further information will be given those who mention this journal.

THE SPEED BOOSTER.

It Supplies Additional Air to the Mixture and Automatically Perfects Combustion in the Cylinders.

The Reflex Ignition Company, 211 High avenue, Cleveland, O., guarantees a saving of gasoline of from 20 to 35 per cent. when the speed booster shown in the accompanying illustration is attached to the intake manifold of the motor. It is stated that tests have



The Reflex Speed Booster.

proved it impossible to obtain a satisfactory mixture for all speeds and that at high speeds a great many of the gasoline molecules do not ignite, but deposit in the cylinders in the form of carbon. This is the result of an insufficient amount of air. The speed booster is designed to overcome this condition by supplying the necessary air to perfect combustion at the various motor speeds. It is automatic in action and when the car is running at a speed of eight miles or under, very little air is admitted to the mixture. As the speed gradually increases, however, the amount of air taken in increases proportionately. It is obvious that this arrangement will minimize carbon formation. A perfect mixture will greatly raise the efficiency of the motor and the speed of the same will be increased fully 25 per cent. Installation is simple, complete instructions being supplied with each booster. The retail price is \$2.50. Dealers will do well to obtain the selling plan and should mention this journal when writing.

ORNAMENTS FOR RADIATORS.

New Radiator Cap Ornaments Made of Metal and Enamelled in Appropriate Colors Are Very Attractive.

The Gus Balzer Company, 1777-79 Broadway, New York City, is producing several new radiator ornaments, two of which are illustrated herewith. The policeman,



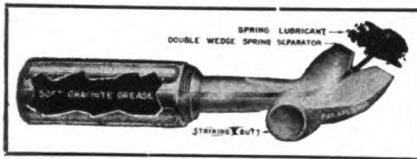
Ornaments for Radiators.

or "Stop Safety First" emblem, measures eight inches in length and 2½ inches in width. It is made of metal and being finished in appropriate colors, is sure to attract attention. The "Red Devil" is 3½ inches in height and five inches wide. This ornament is constructed of metal and made attractive by being finished in red enamel. Both are made to bolt to the radiator cap, and each retails at \$1.50.

TOMAHAWK SPRING LUBRICATOR.

Wedge Shaped Tool Driven Between the Spring Leaves and Supplies Lubricant by Turning Barrel.

The Charles W. Manzel Company, 309 Beard avenue, Buffalo, N. Y., is manufacturing a handy tool, illustrated herewith, for the lubrication of car springs. Because of



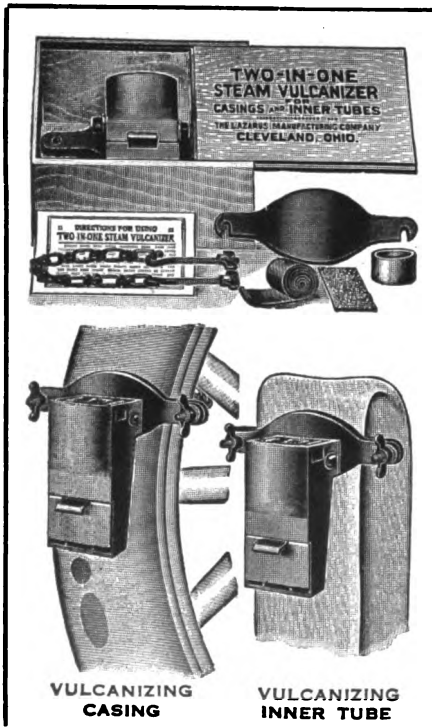
Tomahawk Spring Lubricator.

its shape it has been designated the Tomahawk Spring Lubricator. It consists of two parts, the tomahawk end and tube. The latter is filled with soft graphite grease. Its operation is simple. The wedge-shaped end is driven between the spring leaves by striking the butt with a hammer. By turning the barrel, the grease is forced between the leaves. The tool is made of the finest drop-forged steel, hardened and nickel plated. It retails at 75 cents.

TWO-IN-ONE STEAM VULCANIZER.

Portable Device, Adapted to Casing and Tube Repairs, Uses Enclosed Gasoline Flame.

A portable vulcanizing outfit designed for use on both casing and tube repair work is being produced by the Lazarus Manufacturing Company, Cleveland, O.



Lazarus Vulcanizing Outfit.

for attaching to the shoe, hook bolts, thumb nuts, roll of repair gum, measuring can, sandpaper and instruction sheet. The retail price is \$2.50. Further particulars will be supplied by the company to those who mention this journal when writing.

This vulcanizer applies the steam heat to the patch and is simple and safe in its operation. Water is placed in the vulcanizer at the factory and it requires no further attention, as the steam is condensed back into water and is then used over again.

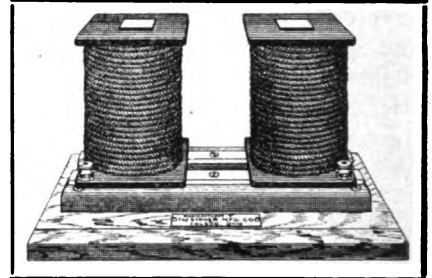
A measuring cup furnished with the outfit holds the exact amount of gasoline required to complete the operation so that the use of gauges and thermometers is not required. The flame is enclosed so that it can be used with entire safety.

The complete outfit includes the vulcanizer, chain

QUALITY MAGNET CHARGES.

Instruments Using Direct Current of Six, 110 and 220 Volts for Charging Electro Magnets.

The Sypher Manufacturing Company, Toledo, O., is producing the magnet charger shown in the accompanying illustration. The units are wound for use with a cur-



Quality Magnet Charges.

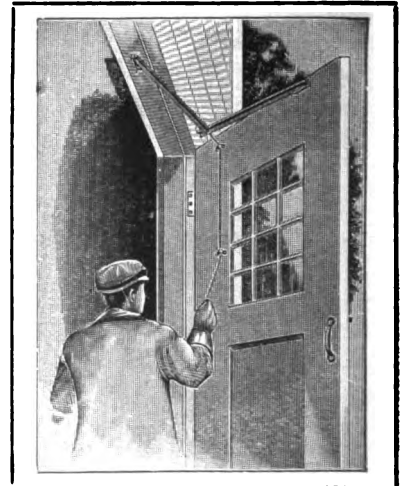
rent of six, 110 or 220 volts. The six-volt charger can be operated on a set of five dry cells, or from a six-volt storage battery. The manufacturer recommends the latter. The chargers are mounted on a heavy varnished oak base. The windings are protected by vulcanized ends and covered with a special heavy shellaced cord. Full instructions are furnished with each instrument, so that anyone can operate them. Any commercial magnet may be remagnetized, as the pole pieces are adjustable. Special pole pieces for the charging of Ford magnets, without necessitating their removal from the flywheel, can also be obtained. The complete instrument weighs 20 pounds. It is rigidly constructed and guaranteed for five years against defects of material or workmanship. The six-volt charger retails at \$20, the 110-volt type at \$23 and the 220-volt model at \$25. The special Ford pole pieces sell at \$3.50.

STEEL STAY FOR GARAGE DOORS.

A Device Made from Wrought Steel That Will Hold the Garage Door Open in a Violent Wind.

For the motor car owner whose garage is equipped with swinging doors, the Stanley Works, New Britain, Conn., is manufacturing a wrought steel door stay to hold the door open under any circumstances.

It is strongly constructed from a one-inch angle iron. The stay is fastened to the top of the inner side of the door and to the upper part of the door casing, as shown in the illustration. When the door is opened this stay prevents the member from being blown back and will hold it firmly against a strong wind. To close the door all that is necessary is to give the attached chain a slight pull, which throws the bar off centre and into a folding position, and draws the door closed. The stays are packed in pairs, as there is a right and left hand member. All necessary screws and chain guide staples are supplied with it. They can be obtained in plain steel, japanned and rust proof sherardized finishes. Length when open is 48 inches and closed 27½ inches. This company also produces complete garage door sets at reasonable prices.



Steel Stay for Garage Doors.

FILM ACTRESS CROSSES CONTINENT ALONE.

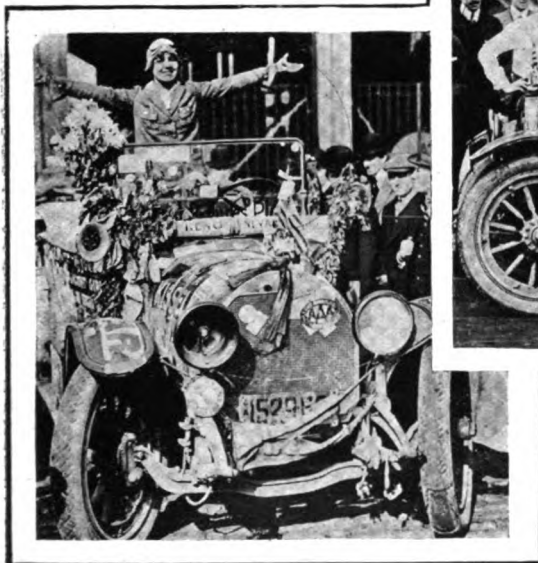
ANITA KING, "Paramount Girl," who undertook to drive a KisselKar "48-Six" from San Francisco to New York City without an escort, completed her trip late in October. She delivered several letters to Mayor John Purroy Mitchell, which had been given her by the mayors of cities along her route. Chief of Police Healy of Chicago gave her a letter to all police officials, asking their greatest consideration for her as a favor to him and twice this stopped the police processes when she was overhauled by motorcycle men for exceeding the speed limit.

Miss King was nearly exhausted when she reached New

York. She was in a convertible sedan four-cylinder model, selling at \$1035, and a convertible sedan six at \$1200. Both are seven-passenger cars and have much of the exterior appearance of a finely finished limousine.

WINTON'S FIRST CUSTOMER CALLS.

A recent caller at the great Winton plant in Cleveland was Robert Allison of Port Carbon, Penn., who was the first man to buy a motor car



Anita King Arriving in New York City in the KisselKar with Which She Crossed the Continent.

from the Winton company. He went to Cleveland in 1898 to buy a "horseless carriage" and the demonstration was given satisfactorily by Mr. Winton himself. The car was the first legitimate sale on the books of the Winton company, and was the first of an output of four single-cylinder models. Mr. Allison was 70 years old when he made his purchase, which makes him now 87.

MASSACHUSETTS AUTO ACCIDENTS.

The complete record of automobile accidents on Massachusetts roads kept by the State Highway Commission, shows that in nine months 218 persons have been killed and 4650 have been injured. These figures are being given much prominence by many Massachusetts newspapers, which are demanding some sort of legislation to cut down the casualties. The proportion of the accidents that occur at railroad grade crossings is not given.

York and after it was all over indulged in a typical feminine cry. She had to lay off one day at South Bend, Ind., because of exhaustion, but the next day resumed her journey. She spent a week in New York theatres telling the crowds about her experiences.

The white lettering on Miss King's car is covered with the autographs of persons she met on her trip and there are more than 1000 names signed on the canvas covering that fits over the back of the seat.

TWO NEW STUDEBAKER CARS.

Two new closed body cars have been added to the Studebaker line for winter use—a convert-

INDUSTRIAL HAPPENINGS AND COMMENT.

THE Studebaker Corporation has an established policy of keeping in touch with its selling organizations by frequent visits at the Studebaker branches of the higher officials of the company. Dealers in the neighborhood are invited to the branch to discuss selling, manufacturing and advertising problems. The officials now en tour in a special car include L. J. Ollier, vice president and director of sales; H. T. Myers, sales manager of the commercial car division; James G. Heaslet, vice president in charge of manufacturing; J. E. Grady, sales manager for Canada; H. A. Biggs, advertising counsel and connected with Frank Seaman, Inc.; R. H. Williams, manager of the Detroit branch. R. T. Hodgkins, sales manager; A. R. Erskine, president of the corporation; C. C. Banch, treasurer, joined the party at Chicago.

The Four Wheel Drive Auto Company, Clintonville, Wis., has been compelled by increased business to add to its plant. These additions include a machine section 54 by 120 feet, a new stock room 46 by 120 feet, a new heat treating and tempering room 20 by 40 feet. There has been added a number of heavy turret lathes, milling

The Detrolter Motor Car Company, Detroit, of which Alfred O. Dunk is president, recently moved into its new plant at Vermont avenue, on the Grand Trunk railroad. Quality rather than quantity is the basis upon which manufacture of the Detrolter car will be conducted, which is described as a supreme quality machine at medium price. As chief lieutenants to Mr. Dunk are Wallace C. Hood, general sales manager; Walter Bamford, production manager; R. T. Yeats, director of exports; Frank H. Eldredge, advertising manager; R. Ulrich, service manager; R. B. Merrill, purchasing agent.

The Studebaker Corporation has awarded, through W. C. Rodd, construction engineer, a general contract to the Wisconsin Bridge Company for the erection of a building 50 by 350 feet adjacent to plant No. 3 in Detroit. This will be used for "tuning" cars preparatory to shipment. A three-story modern factory building, 62 by 170 feet, is now under way. This makes an addition to building No. 5-A, also at plant No. 3, while ground was broken there recently for an addition to building No. 25-A. The cost of these buildings is about \$75,000, and they mark the beginning of extensive factory enlargements by Studebaker at Detroit.

The Detroit Steel Products Company's record business for September was celebrated recently by 30 members of the company as the guests of J. G. Rumney, general manager, at a banquet at the Detroit Athletic Club. Speeches were made by Walter S. Russel, president of the Russel Wheel and Foundry Company, and by R. S. Drummond, vice president of the Detroit Steel Products Company. The September output, including both Detroit self-lubricating springs and Fenestra solid steel windows, was the biggest in the company's history. Prospects are that during the remaining months of the year this record will be exceeded.

The Grant Motor Company, Findlay, O., is making several important additions to its plant. A new service building is being erected at plant No. 1. Two new warehouses are now well under way at plant No. 2, and they will be devoted to storage of complete cars and parts. The additions will give the company 25,000 more feet of much needed floor space. A modern type loading platform is being completed in front of plant No. 2, where finished cars can be run directly from the warehouse into the freight cars for shipment. The daily output is now about 30 completed cars.

The Hupp Motor Car Company, Detroit, shipped 1238 cars during the month of October and orders are 50 per cent. greater than for the corresponding month of last year. The shipment record exceeds that of the same month of any previous year, and Lee Anderson, sales and advertising manager, reports that production cannot keep up with the orders. Indicative of the demand for enclosed cars is the statement that during October the company shipped 300 per cent. more cars of that type than a year ago.

The Bosch Magneto Company, New York City, has signed contracts with nine prominent concerns in the automobile and motor truck fields to use Bosch magnetos for the coming season. The companies are the Chandler Motor Car, Cleveland; Crawford Automobile, Hagerstown, Md.; Continental Motor Manufacturing, Detroit; O. Armleder, Cincinnati; Palmer-Meyer Motor Car, St. Louis; H. E. Wilcox Motor, Minneapolis; U. S. Motor Truck, Cincinnati; Hendrickson Motor Truck, Chicago; Alamo Manufacturing, Hillsdale, Mich.

The Chalmers Motor Company, Detroit, is planning a convention of its distributors and dealers to meet Nov. 15-17. At least 600 are expected to attend.



New Home of the Detrolter Motor Car Company in Detroit.

machines, boring bars and drill presses, as well as large furnaces and electric pyrometers for the heat treating department. A new steel building has just been completed and will be used for the storage of oils, greases and paints.

The King Motor Car Company, Detroit, has issued a little booklet entitled "1700 Miles on HI," which is descriptive of the recent road tests of two King eights through more than 150 California towns and sand, mud, streams, ploughed fields and mountain passes. The booklet is very appropriately illustrated with photographs and maps, and its text relates to the complete story of the runs.

The Apperson Brothers Automobile Company, Kokomo, Ind., announces that with the completion of the new factory units recently decided upon and to contain 500,000 square feet of floor space, the production of the company will be advanced to 10,000 cars a day. Two new buildings are now under way as additions to plant No. 2, which will provide 150,000 square feet of floor space and will be fitted with \$200,000 worth of new machinery.

The Penberthy Injector Company, Detroit, has secured the rights for the Ball & Ball carburetor in the United States and Canada, and promises to become one of the most prominent manufacturers of carburetors in this country. F. H. Ball and his son, F. O. Ball, who were for many years connected with the Ball Engineering Company, Erie, Penn., have been retained by the Penberthy company as engineers.

PRACTICAL MOTOR CAR REPAIRS.

SPARE moments of garage workmen can be well utilized in making equipment and tools. The illustrated practical and handy grease gun

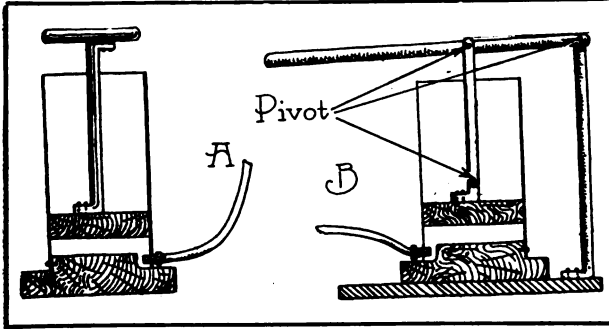


Fig. 103—Home-Made Hand Grease Pump and the Same Equipped with Lever.

can thus be made at trifling expense.

Plug up one end of a piece of steel tubing, which is about six inches in diameter by 12 inches long, with a block of wood that has been turned in a lathe to secure a tight fit. This plug should be secured in position by drilling holes through the pipe into the block and turning screws into it.

Near the base of cylinder thus formed, drill and thread a hole for screwing in a small outlet pipe. If the plug obstructs the passage into the outlet pipe, cut away all that is necessary. To the end of the outlet pipe attach a rubber hose of any desired length.

The grease gun piston consists of a block of hard wood about two inches thick and turned in a lathe to the diameter of the cylinder's bore. To this piston attach a strong steel rod that has a handle at the top.

Of course to fill this cylinder with grease it is necessary to remove the piston each time, but it will be found that this device allows a rapid flow of lubricant and will permit the operator to apply his weight when pressing down the piston.

A lever attachment for the same pump is shown at Fig. B.

ABSTRACTOR TOOL.

In Fig. 104 A is shown an abstractor tool with screws that have a different pitch and allow great pressure to be exerted. The tool consists of a plate of good steel about an inch in thickness and two inches in width. The centre of the plate is drilled and tapped to receive an inch bolt about $2\frac{1}{2}$ inches long. This bolt is then drilled

and tapped to take a $\frac{7}{16}$ -inch bolt, which is about five inches in length. A number of $\frac{1}{2}$ -inch holes should be drilled near the ends of the plate. Two suitable lengths of $\frac{1}{2}$ -inch stock threaded at both ends, four nuts and a few washers complete the device. The illustration shows the complete assembly. As the $\frac{1}{2}$ -inch studs may be inserted into any hole, this tool is adapted to a wide range of work, such as pulling gears, flywheel, wheels, etc.

ALIGNING GAUGE FOR WHEELS.

It is obvious that to reduce tire expense to a minimum and to maintain easy control of the car, the front wheels must be in alignment. At Fig. 104 B is illustrated an easily constructed aligning gauge. Grind to a point the ends of two pieces of cold rolled stock of about $\frac{1}{2}$ -inch in diameter and 40 inches in length. In a metal block two inches square and four inches long drill half-inch holes to admit the bars. Holes should be drilled and tapped at the side of the block for retaining the bars, as shown. Thus the bars may be adjusted to any required distance, and it is a simple matter to place a chalk line at the centre points of the front rims and obtain a true alignment.

TESTING FORD COIL.

When a Ford car is equipped with a set of dry cells, or storage battery, for easy starting, the setting of the coil and the locating of ignition troubles is not a difficult matter. While the plugs can be removed from the cylinder and tested by

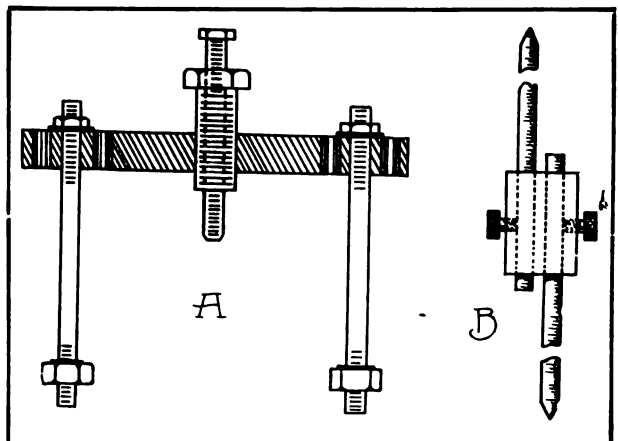


Fig. 104—A, a Practical Abstractor Tool; B, Gauge for Aligning Wheels.

turning the motor over by hand until the contacts are made at the timer, a much easier method is shown in Fig. 105 A. Place the coil switch on the

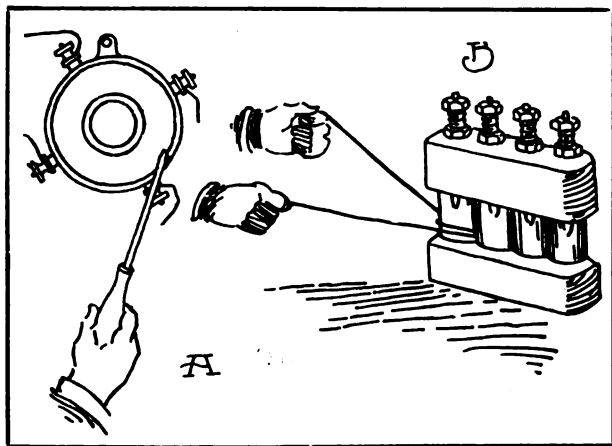


Fig. 105—A, Testing a Ford Coil; B, Cleaning Oil Sight Gauges.

battery side and then make a contact at the timer with a screw driver, as illustrated. This serves to complete the circuit in the same manner as does the roller. A buzzing sound is produced at the coil and each unit should be tested separately and set so that the sounds from all are alike. The coil may also be tested by connecting a wire to any metal part of the car and placing the other end of it on the primary connection of the coil.

CLEANING OIL SIGHT GAUGES.

Some oiling systems include one or more tube like glass gauges, which indicate to the operator the amount of lubricant being supplied to the motor. Dirt and other foreign matter gradually accumulate on the glasses, which makes it difficult to see the oil. While the front may be readily cleaned with a cloth, it is somewhat more difficult to clean the sides and the back. Fig. 105 B illustrates an easy method of accomplishing this. Loop a piece of twine around the gauge as shown and by drawing it backwards and forwards the surface is easily cleaned. The passing of the twine around the glass can be made easy if a thin wire be used.

LUBRICANT FOR MILLING CUTTERS.

An excellent lubricant for milling cutters used with a pump can be made by mixing together and boiling for about 30 minutes, $\frac{1}{4}$ pound sal soda, $\frac{1}{2}$ pint of lard oil, $\frac{1}{2}$ pint of soft soap and enough water to make 10 quarts of solution.

SPARK PLUG ATTACHMENT.

Trouble due to faulty spark plugs can be practically eliminated by use of the device shown in Fig. 106 B, which consists of a spark gap formed on an insulated base. The base, made of fiber, is attached to the plug in the same manner as is the secondary wire. The upright pin should be machined, as shown, and attached to the base, and to the bottom of this pin the secondary wire should be attached. The screw in the longitudinal position is for adjusting the gap, while the one in the upright position is for locking the first screw. The principle of this device is based upon the fact that if an electrical current is compelled to jump an air gap, it will seek the next gap even though there be an easier means of passage. This attachment should have a tendency toward producing the spark in the cylinder even if the porcelain of the plug should be broken.

PROTECTING SPARK PLUGS.

Spark plugs carried loosely in the tool box are liable to be broken by contacting with tools. A better plan for storing them is shown in Fig. 106 A. Cut a section a trifle greater than length of the plug from a discarded garden hose. When the plug is forced into the centre of the hose as illustrated, it is fully protected against damage.

STRAIGHTENING BENT FRAMES.

Several methods are extensively used for straightening bent frames, but the best results can be obtained by gradually bending the metal back to shape, rather than striking it with the hammer. Apply a blow torch at the point of bend until the metal becomes red hot. Now ad-

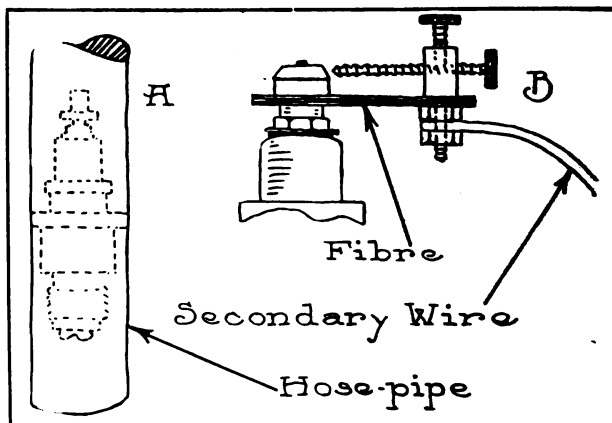


Fig. 106—A, Case for Carrying Spark Plugs; B, Spark Gap for Spark Plugs.

just a large wrench to the end of the frame, as shown in Fig. 107 A, and straighten by a steady pressure. If it is now found that the part is not

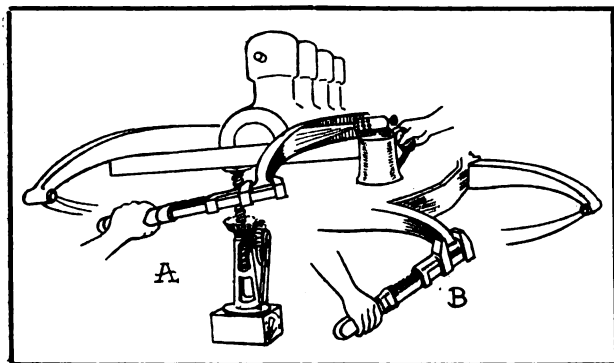


Fig. 107—A, Straightening a Bent Frame After Heating; B, Truing with a Wrench.

absolutely parallel with the corresponding part, it may be trued by applying the wrench as shown in Fig. B.

SIMPLE VALVE REAMER.

Frequently it is found to be impossible to seat a new valve because the seat has an improper angle, due to wear from continuous grinding or the heavy hammering action induced by strong valve springs. When a cutter is not easily obtained, a suitable substitute can be made from an old valve, as shown in Fig. 108 A. Cut away both sides of an old valve which has a perfect head, as at A. Next file away one edge so as to afford a cutting clearance, making sure that the cutting edges are both aligned in the same direction. Sharpen the cutting edge and then harden. The cutter will be of the correct radius and angle and as the valve stem serves as a guide, it will be true enough for all practical purposes. A front view of the finished tool is shown at B.

CLEANING STEEL RULES.

Steel rules when exposed to the air often become dirty and rusty, so that it is difficult to determine the fine division marks. They can be easily cleaned by coating the scale with oil and then rubbing it with No. 0 steel wool. This will remove rust. If the rule is merely discolored it can be brightened by using powdered pumice.

LOCKING WOOD SCREWS.

Wood and composition bodies were often used on cars of the earlier makes. Many wood screws were used in the construction. As these fre-

quently worked loose, a practical motorist used the following method to make them secure: A small staple such as is often used for fastening wire was driven into the wood, as shown in Fig. 108 C. The flat part enters the slot in the head of the screw and securely locks it.

FITTING PISTON RINGS.

When fitting new piston rings it is often necessary to file the ends so that a proper fit can be obtained. It is a difficult operation to make register accurately. A method which will insure register is shown in Fig. 108 D. Clamp the file in an upright position in the vise and place the ends against the file as shown. The metal can be removed by moving the ring up and down.

FACE LOTION FOR MECHANICS.

A harmless face lotion, which will aid in the removal of grease and dirt from the face and hands of the mechanic can be made by mixing seven ounces of pure alcohol, one ounce of glycerine and a few drops of camphor. This preparation also reduces the size of the skin pores and makes for a better appearance of the complexion. It also prevents cracking of the skin.

PRESERVING SHELLAC.

Shellac is used extensively in making certain repairs on the machine, but should it be exposed to the air for any length of time it quickly dries and is useless. It should be placed in a bottle that is fitted with a wooden stopper. A cork stopper is not advised, as it is easily torn by the adhering shellac. The wooden stopper may be used for smearing purposes.

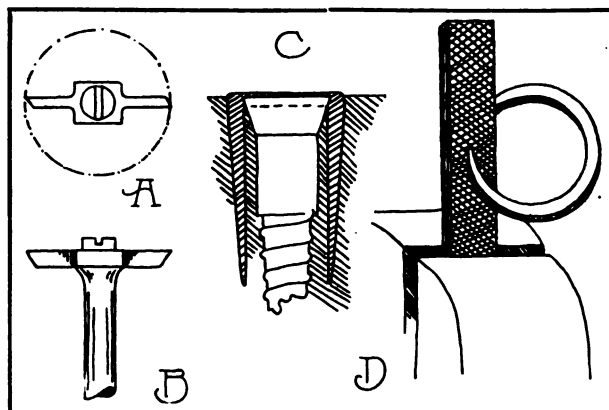


Fig. 108—A-B, Home-Made Valve Reamer; C, Effective Lock for Wood Screws; D, Filing Piston Ring to Obtain Accurate Register.

KNOX TRACTOR HAULED FORTY ONE TONS.

HAULING a 33-ton boiler from Holmsburg, Penn., to Philadelphia was a problem that recently fell to the lot of the Henderson Contracting Company. The vehicle on which the boiler was to be carried weighed eight tons itself, making the total weight 41 tons.

According to the most conservative estimate the task would have required 28 horses to keep the burden in motion, and would have necessitated 10 more horses, pulling on a block and tackle, to start the load every time it stopped. The conditions of travel in the cities, the length of time the work would require, and other factors made the work seem monumental.

It was here that a small gasoline tractor demonstrated its utility. A representative of the

short time. Because of its bulk as compared to the small tractor the load attracted much attention in the streets through which it passed.

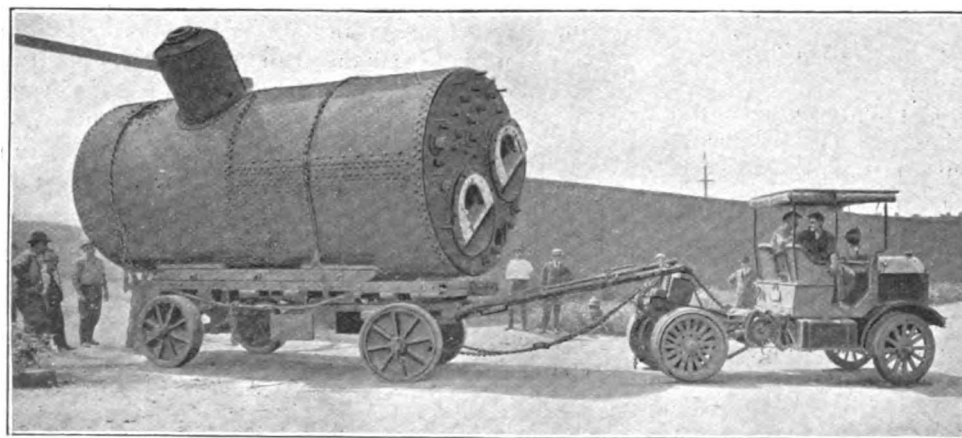
MOTORISTS MAY PAY FOR ROADS.

The large sums required to repair and keep New Jersey roads in condition—estimated by Commissioner Stevens at \$40,000,000 at the present—has created a sentiment for greater taxation for automobile owners and the repeal of the reciprocity law which would make it necessary that non-resident owners pay the usual license fee.

Census of traffic taken on the main state roads indicate that from 20 to 31 per cent. of the traffic consists of foreign cars. A number of coun-

ties are hard pressed for funds for road work and this movement is growing to menacing proportions.

It is said that Pennsylvania and New York, notwithstanding their reciprocity laws, have subjected New Jersey motorists to considerable annoyance. The railroad influence would naturally be thrown to-



A Knox Tractor Hauling a Boiler and Truck Weighing 41 Tons Through Philadelphia to New Power House at Fairmount Park.

Knox Motors Associates finally convinced the contractor that though the tractor he proposed to use was rated at only five to 15 tons, it had ample power to haul the load.

The heavy tongue of the wagon carrying the boiler was secured about on a level with the tractor's deck, as can be seen in the accompanying illustration, and was attached by heavy chains and over blocking about 18 inches high.

The effect of this arrangement was to distribute the pull downwardly in proportion to the forward pull. Consequently, the more power required to move the load made for a greater traction applied to the wheels.

The start was made without difficulty and without power from any other source than supplied by the tractor. The boiler was hauled to its destination without incident in comparatively

ward a movement to repeal reciprocity agreements as a means of stopping the rising tide of motor touring which is hurting passenger revenues.

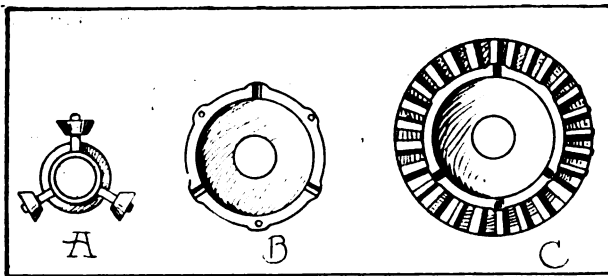
With an eight-cylinder King, W. H. Carter of Salt Lake City, recently crossed territory in southern Utah where a motor car had never gone before. He went through the Sink valley, which is undrained and in which the mud at all times of the year is two or three feet deep. Beyond that he found roads with high centres, with sand on either side. Freight horse wagons have used it in the past. He got through from Alton to Kanab, Utah, only with great difficulty. His report makes it apparent that there is no possibility for a touring road in that part of the state of Utah for many years to come.

SUGGESTIONS FOR THE FORD CAR OWNER.

The Action of Differential Gearset, Which Is a Three-Pinion Type, and Its Use in Practise—Construction of the Rear Wheel Brake and the Connections.

The 35th article dealing with the construction, operation, maintenance, care and repair of the model T Ford chassis is devoted to a consideration of the rear axle, the differing components and the manner in which they are assembled and the purposes they serve.

REVERTING to the rear axle, the reader has been informed that the housing encloses the differential assembly, which is mounted on long roller bearings, and that the inner ends of



The Ford Differential Components: A, the Spider and the Three Pinions; B, Half the Gearset Case; C, the Other Half of the Gearset Case and the Master Gear.

the axle shafts are keyed into the two gears of the differential, and that these two gears mesh with smaller pinions that are mounted on steel pivots, the inner ends of the pivots being in the hub of the differential spider, and the outer ends in the cage or housing that surrounds the differential gearset. This differential assembly does not differ from others of the same type that are generally used in pleasure car construction, aside from the fact that it has, because of its small size, three pinions, each spaced 120 degrees apart on centres, between the two gears, instead of four pinions, which is the usual number with assemblies of larger size.

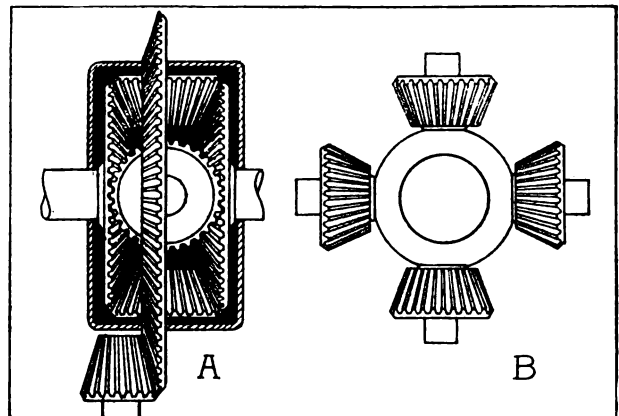
The accompanying illustration shows in simple diagram the elements of a differential or compensating gearset, this, however, for the purposes of description, showing four pinions instead of three. The gearset illustrated shows the two inner ends of the axle driving shafts engaged with the two gears, and these gears are keyed to the shafts. As assembled in the axle housing either shaft may be turned freely, and if one is turned in one direction the other will turn in the opposite direction, because of the turning of the pinions between the gears. Noting the construction, one will understand that if either of the two

axle shafts is turned forward the pinions must of necessity be turned, and that the one gear must turn the other gear backward at the same speed, the pinions revolving between them.

Straight and Turning Movement.

But this applies only so long as both axles are free. When one axle is supported by a wheel resting on the ground and the other wheel is off the ground, then, if the driving shaft is turned, the free wheel will be revolved and the other remain still. With both wheels on the ground neither can be turned faster or slower when the vehicle is moved straight ahead. In this condition the driving pinion of the shaft, meshing with the gear that surrounds the differential gearset, will turn both shafts and both wheels.

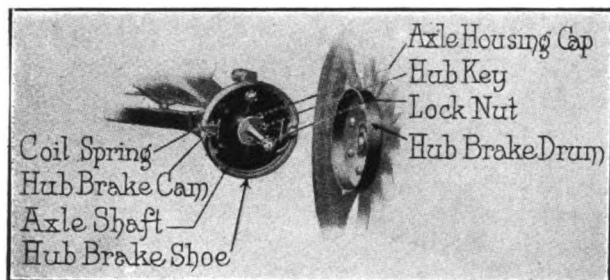
When the vehicle is moving in the radius of a circle, such as turning a corner (which is practically the extreme of differential action), the outside wheel must move faster than that inside, and in such a condition the driving power is directed to the outside wheel, while the differential pinions will be turned slightly. The power as applied will be directed toward turning the outside wheel, and the action of the pinions will be to turn the inside wheel slightly backward. Generally speaking the inside driving wheel of a vehicle serves as a pivot when a turn is made, so that comparatively little if any tractive effort is



Principles of a Bevel Gear Differential Gearset: A, the Assembly, Showing the Driving Pinion Meshing with the Master Gear Surrounding the Two Gears and the Four Pinions; B, How the Pinions Are Mounted in the Case Between the Gears.

applied to it, the outside wheel affording the propulsion.

One understands that the traction wheels of a



The Principal Components of the Rear Wheel Brake of the Ford Chassis.

rear wheel driven motor vehicle have, as the wheels turn, a straight forward movement normally so long as the wheels are on a level surface, and that this can only be changed by turning the forward wheels. In turning, the tendency of the rear wheels is to keep straight on and the front wheels serve as pivots, so that the rear end of the vehicle is swung, in a sense, although from momentum and traction it is carried forward. This swinging movement is not ordinarily realized until a machine is driven on wet, muddy or slippery surfaces, when, because of the lack of traction with one wheel, especially the inside wheel if turning, the outside driving wheel will drag the inside wheel from its path sideways, this causing what is familiarly known as "skidding."

This side movement will continue until the inside wheel obtains traction equal to that of the other wheel, which will equalize the driving impulse, and then the forward wheels will again become a pivot for the turning of the machine. The driving impulse of the engine is not transmitted to the inside wheel in the event the outside wheel loses traction in making a turn, for the condition is then like when one wheel is jacked, the free wheel turning and no power being transmitted to the inside wheel, and the forward movement of the vehicle is from the momentum only.

Declutching When Turning.

The possibility of the vehicle skidding when making a turn is generally averted by disengaging the clutch, for then the machine will coast and it can be guided by the front wheels just as is a vehicle with four free wheels (one drawn by an animal for instance), or by reducing the gear ratio. The cessation of driving power allows the machine to move by its momentum, and then it can be easily controlled by the steering wheel and

the brakes. The slower the wheels are moving the less the possibility of skidding, and the better is the control.

As the driving and braking strains are directly through the axle shafts, these are proportionate to the speed of the vehicle and are constantly varied by conditions. The movement of the differential pinions, because of their size, is faster than that of the differential gears, and the gearset assembly turns on the bearings once for every $3\frac{7}{11}$ revolutions of the pinion on the rear end of the driving shaft.

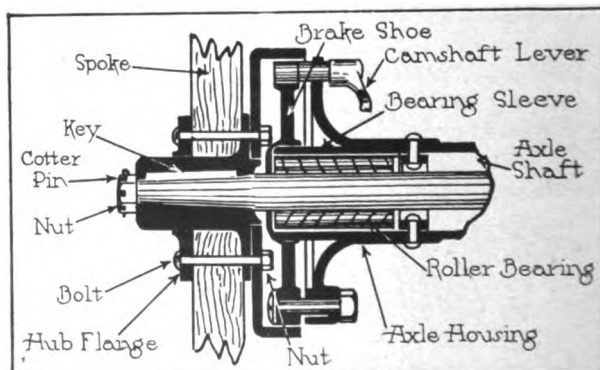
When the machine is moving the stress from the engagement of the clutch is comparatively slight, but when the vehicle is standing and power is applied it must be so slowly that there will be yield without strain, for starting from "anchorage" requires much more power than to continue movement afterward.

Large Horsepower for Weight.

A fact is that for normal driving the maximum power production of an engine is seldom needed, and yet as an engine will necessarily require a specified volume of gas for each revolution, the only economy possible is by careful carburetor adjustment and obtaining the highest efficiency of the power transmission system. Racing the engine is waste of fuel and usually causes unnecessary wear.

The horsepower rating of the Ford engine is 22.5 and the weight of the machine is from 1100 to 1200 pounds, so that there is approximately one horsepower to every 50 pounds of weight. This ratio of horsepower to weight is much larger than is generally found in other automobiles.

The intention is that the machine shall be driven on the high or direct drive gear ratio so far as possible, and that the low speed ratio shall be for starting and for climbing grades too steep for the machine to be driven up them with its maximum power directly used. That this state-



Cross Section of Rear Axle and Wheel Hub, Showing the Parts of the Assembly and Their Relation.

ment is well founded is substantiated by the construction, for the low or reverse speed ratios can only be used during the period that pressure is applied to the respective pedals.

Driving Thrust on Engine Case and Frame.

The reader will recall that the power generated by the engine is transmitted through the driving shaft, enclosed in the torque tube, to the rear axle, and thence through the cross shafts or driving shafts of the rear axle to the road wheels. The forward end of the driving shaft is coupled to the shaft of the gearset by a universal joint enclosed in a housing or globe that is in turn enclosed in a housing that is divided transversely and bolted to the end of the engine case.

There is no drag on the torque tube, but to the contrary there is a forward thrust by the tube and its globe-like end upon the rear end of the engine base. This universal ball, so-called, is so large and its surface area so contacted with the walls of the universal ball cap or housing that no matter in what position the driving shaft may be there is full thrust taken and absorbed by the engine case and, in turn, by the side members of the chassis frame.

Three-Point Support for Driving System.

One will note that the construction affords what may be regarded as three-point power transmission, the engine case carrying the forward end of the drive shaft and the axle shafts, on which are the road wheels contacting with the ground. As the driving shaft is coupled by a universal joint that compensates for angularity in a vertical plane and is carried on a plain bearing at the forward end of the torque tube and a ball thrust and a roller bearing at the rear end, there is no side pressure caused if the axle housing is raised or lowered at either end, due to the deflection of the spring.

The axle might be swung slightly without causing a strain upon the shaft, but because of the necessity of maintaining the relation between the driving pinion at the rear end of the driving shaft and the master gear of the differential gearset, which must mesh correctly to fully transmit the power—or transmit it without loss, the axle and torque tube must always move as a unit. To prevent the relationship being changed there are two radius rods extending from brackets at the forward end of the tube, just back of the universal joint, to the rear axle.

Radius Rods Hold Axle.

The tube end is reinforced by a sleeve that has an eye at either side, and the ends of the radius rods, which are stout steel bars, are passed through these eyes. The ends of the rods are

threaded and there is a nut either side of the eye, the outer or forward nuts being castellated so they may be secured against loosening. The rear ends of the rods have eyes formed in them and these eyes are secured to brackets on the brake flanges on the ends of the axle housing by bolts and nuts. The radius rods can be adjusted at the forward ends so that the exact relation can be obtained, and when this has been done there is no probability of a change through wear. The driving thrust and braking stresses are taken collectively by the rear axle, the radius rods and the torque tube.

The rear axle assembly then has freedom to yield to such a degree as is necessary to protect it from road shock and from strains that would be extremely destructive if the construction were rigid. Two brackets that are known as spring perches are bolted to the brake flanges, and to these the ends of a transverse or cross spring are bolted. This spring has an unusual arched cen-

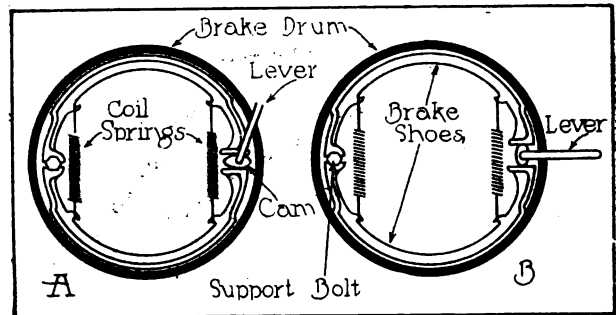


Diagram of the Action of Internal Expanding Brake: A, Shoes Clear of the Wheel Drum; B, Shoes Expanded by the Turning of the Cam by Its Lever.

tre, and on this is bolted the rear cross member of the chassis frame.

This rear cross member, the side members and the front cross member constitute the frame of the chassis, the forward member being similarly bolted to the forward spring, which is also a semi-elliptic cross type.

The rear spring serves to cushion the frame carrying the engine from the stresses upon the rear wheels, and the entire construction has a flexibility that is decidedly protective in that it will not resist as would a rigid frame, and the yielding will minimize the strain and distribute it, rather than concentrating it with damaging effect.

The outer ends of the axle housing are reinforced by sleeves that carry the flanges for the brake shoes, and which also serve as anchorages for the brackets for the rear ends of the radius rods. These flanges also stiffen the ends of the tube, in which are mounted the roller bearings.

for the axle shafts. The flanges are castings that are fitted to the tubes and secured by rivets. The flanges are webbed to afford strength and secure light weight.

Wheels Keyed on Axle Shafts.

The axle shafts, which are keyed into the differential gears, are retained in the housing with the tapered ends projecting beyond the flanges. The flanges are so mounted that at the tops are the bosses in which are carried the camshafts, and at the bottoms are the anchorage studs or supporting bolts. On the anchorage studs are mounted to lower ends of the brake shoes, these being free to move slightly. The camshafts of the brakes are so formed that when the levers are practically upright the shoes are brought in contact with the faces of the cams, they being contracted slightly by two helical springs that are

brake shoes are bolted to the wheels, and these drums fit snugly over the edges of the flanges, so that there is just sufficient clearance for the drums to revolve freely and the brake shoes are clear of the inner peripheries of the drums. The rear spring is secured to two perches, so-called, which are secured to the flanges, and these are in effect shackles that allow sufficient movement of the spring for deflection and reflexion.

(To Be Continued.)

PHILADELPHIA TO HAVE BIG SHOW.

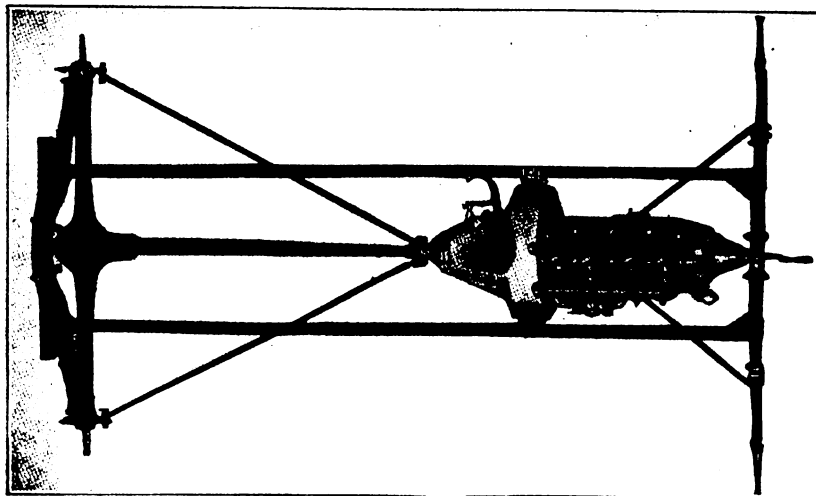
Dissatisfaction among Philadelphia dealers as regards their recent annual shows, owing to the fact that the building in which they were held limited them to 27,000 feet of show space, has resulted this year in the leasing of the city's convention hall, where 60,000 square feet will be available.

It will be necessary to install a heating plant in the building and provide a new floor, but the dealers have enthusiastically undertaken that task. The additional space is expected to make the show one of the largest and best in the country and give it the importance that the Philadelphia show should have.

The officers of the dealers' association who are in charge of this big plan are President William P. Herbert, Chandler; Louis C. Block, former president and Ford branch manager; J. E. Gomery, secretary-treasurer and Hudson distributor; A. E. Maltby, Philadelphia's Winton manager, and J. C. Bartlett of the Bartlett garage.

EAST MICHIGAN PIKE LAID OUT.

A road from Toledo to Mackinaw City, Mich., passing through Detroit, Flint, Saginaw, Bay City, Alpena, Sheboygan and Mackinaw, is being planned. It was recently laid out by a number of motor cars carrying engineers, newspaper men and board of commerce representatives. The pathfinding machines were a Studebaker, a Hudson and a Hupmobile. The engineers are gathering data about the available material to determine which can be used most cheaply in constructing various sections of the road.



The Frame of the Ford Model T Chassis, This Carrying the Engine, Which Is Mounted on the Springs Secured to the Axles, the Radius Rods Preserving the Relations of the Axles.

secured to eyes, as is shown in the accompanying sketch. The brake shoes are normally held in this position, and when adjusted they are intended to have a slight clearance of the drums.

The wheel hubs are designed so that the tapered ends of the shafts fit them, and when keys are forced into keyways cut in the axle shafts and the hubs the wheels will be firmly retained. The keys and the wheels are prevented working out by castellated nuts and cotter pins. The ends of the axle shafts are covered with caps that are threaded on to the hub. The wheels are constructed of wood with substantial hub flanges, which retain the spokes, and the wooden felloes are encircled by steel rims having flanges for the retention of the clincher tires.

The pressed steel drums that encircle the

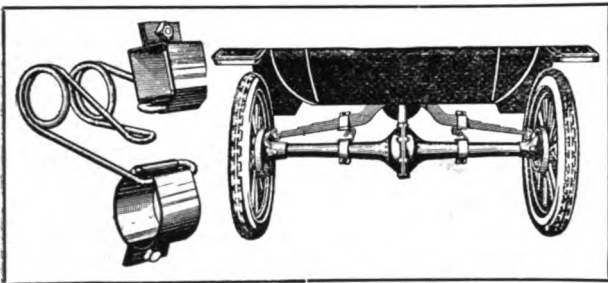
FORD CAR ACCESSORIES AND EQUIPMENT.

NABER'S SHOCK PREVENTERS.

Attachments Which Prevent Shock and Side Swinging and Make Steering of the Ford Car Easy.

Naber's shock preventers for Ford cars are manufactured by the Otis & Moe Manufacturing Company, 1200 West Boulevard, Chicago, Ill. Because of its lightness of weight the Ford car is subject to much jolting when travelling over uneven roads. The attachment shown herewith is designed to prevent this jolting.

It is made of specially prepared and tempered steel, is neat in appearance and in no manner mars the appearance of the machine. Attachment to the car is made



Naber's Shock Absorber and Illustration of How They Are Mounted.

without the boring of holes or change of the springs. The set of four shock preventers is attached by eight bolts.

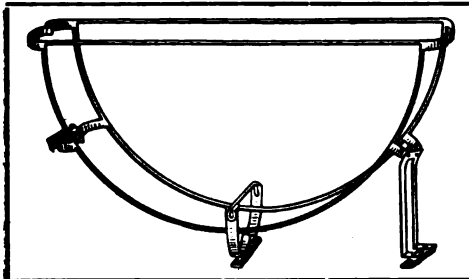
The manufacturer explains that it is the peculiar construction of the springs in the preventer which prevents the violent reaction in the springs of the car. Side swaying is also eliminated, making driving safe under all conditions. The full set of four Naber's shock preventers, two for each spring, retail at \$10. A set of two for front or rear spring sell at \$5.50 the pair.

Inquiries concerning this accessory should be sent to the Otis & Moe Company.

MCKINNON TIRE HOLDER.

Equipment for Carrying Spare Tires on the Ford Car—Positive Locking Device Prevents Theft.

The McKinnon Dash Company, Buffalo, N. Y., has recently added several new accessories to its line of specialties. Among these are two tire holders designed especially for the Ford car. One is constructed for the carrying of a single tire, while the other is for two. They are made of steel and electrically welded. Although light, they are strong and durable. The finish is japan, which is carefully baked. Attachment is made to the running board and fender at the left of the front seat. This position tends to keep the tires cool and clean. The attachment holds the tire securely and there is no side sway to loosen the fender or running board. A simple, but positive locking device insures against theft of the tire. The holders can be used for smooth or non-skid tires, with or without covers, and for detachable rims.



McKinnon Tire Holder.

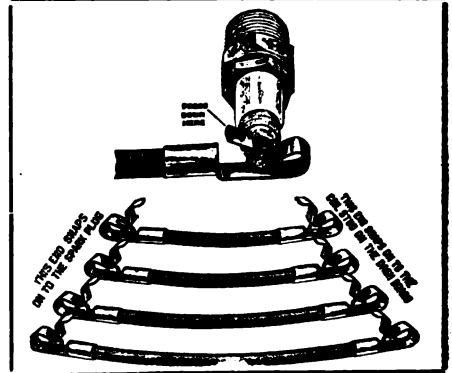
FAHNESTOCK WIRING SETS.

Wiring Sets for the Ford Car Which Are Attached Without Tools and Cannot Work Loose.

The spark plug wiring set for Ford cars, shown in the accompanying illustration, is manufactured by the Fahnestock Electric Company, 129 Patchen avenue, Brooklyn, N. Y. It consists of four secondary wires accurately cut to length and equipped at both ends with the company's patented spring connector.

This arrangement permits attachment to the plugs and coil without the use of tools. It is convenient and efficient. The spring tension makes loose connections impossible. To apply the set to the car it is only necessary after removing the old cables to press down on the thumb piece and snap the connectors over the spark plug and coil connections. The price of this set is 75 cents.

This company also manufactures a commutator wiring set for the Ford car. This consists of four wires, which are enclosed for part of their length in an oil proof braiding. These wires are also equipped at both ends with the patented spring connectors. The set retails at 75 cents. When both sets are purchased together, the price is \$1.25 for the two.



Fahnestock Spark Plug Wiring Set.

FLEXLEVERS.

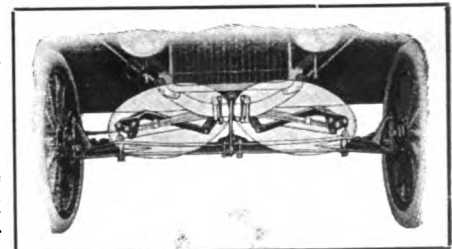
Equipment Which Prevents Shocks from Reaching the Ford Car—Every Part Guaranteed for Life of Car.

By preventing the effects of vibration and jolts from reaching the car, the flexlevers, manufactured by the L. P. Halladay Company, Streator, Ill., and illustrated

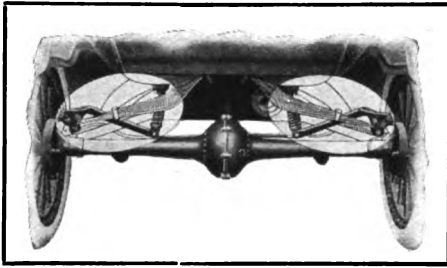
herewith, save the mechanism of the car from immense strains and save at least 25 per cent. tire expense. They do not permit side swaying and thus greatly assist steering and make driving safe under all conditions. There are no wearing parts to get out of order or caps to lose. Lubrication is unnecessary. When properly installed they will last for the life of the car.

Attachment to the car is simple and can be accomplished in about 30 minutes. No special machining is required, neither is it necessary to remove the wheels or jack the car.

Flexlevers are guaranteed against wear or defects of



Flexlevers Mounted at Front of a Ford Car.



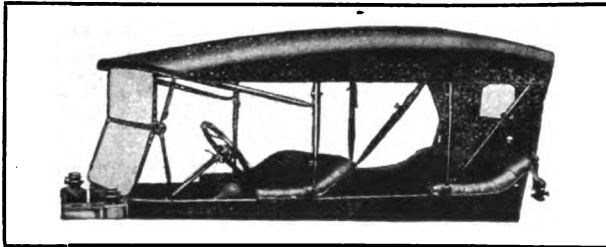
The Rear Set of Flexlevers.

do not prove satisfactory the equipment may be returned and the full purchase price will be refunded.

CRAY SLIP ROOF AND TOPS.

Heavy Rubber Roof, Quarters, Back Stays and Back Curtains, Stitched and Ready to Replace a Worn Ford Top.

When the top on a Ford car becomes worn or leaky, it is now possible to replace the same with a heavy rubber roof, quarters, back stays and back curtain, stitched and ready to slip over the old top frame. This outfit is marketed by the Cray Brothers, 1111 West 11th street, Cleveland, O. It is listed as the Cray slip roof outfit "A," and is designed for 1912, 1913, 1914 and 1915 model T touring cars. As side curtains on most old tops are in good condition, these are not included. The outfit retails to the trade at \$7.50 each, or at \$80 per dozen.



Cray Slip Top for Ford Cars.

This concern also builds a complete extension top of heavy 32-ounce black back rubber. This is built over the Ford body frame and affords a perfect fit. A very easily operated one-man top for touring cars and roadsters is also marketed. The manufacturer declares that this top maintains the same level while being erected as it does when in position. It is staunch and rigid and is made in three grades of material.

Dealers and garage owners should obtain the 512-page catalogue published by this company. It will be sent free on request when this publication is mentioned.

PACO RACING BODY.

Racing Type Body to Be Attached to the Regular Ford Chassis—Many Pleasing Features Involved.

The Peoria Accessory Company, 601-607 S. Washington street, Peoria, Ill., is marketing the Paco racing body



Paco Racing Body Mounted on a Ford Chassis.

any nature for the life of the car, and the company will replace free of charge any broken parts, including springs, at any time. They are sold at \$10 per set of four, or \$6 per pair, front or rear. If after a 30-day trial they

for Ford cars, illustrated herewith. It possesses the graceful lines of the professional racing car. The long cowl dash extends almost to the steering wheel. The bottom line completely hides all rods and crank case, thus affording a rakish appearance. From the seats backward the body resembles the shape of a bullet. Carried in this rear section is a 15-gallon gasoline tank and also a carrying capacity as large as the ordinary trunk. The entrance to this compartment is through a large door. The gasoline tank is removable.

Comfort is assured by the seats being fitted with gently sloping, broad, high backs. These are set on the floor, the bottom sloping toward the back. It will be noticed that the right hand seat is staggered back a few inches, thus affording the driver ample elbow room. The upholstery is of the best grade royal leather, and it is removable. Wind ventilators in the sides of the cowl insure sufficient air to the driving compartment in very warm weather.

TWIN-RIM.

Equipment Which Makes It Unnecessary to Change Tire on the Ford Car When Puncture or Blow Out Occurs.

The twin-rim illustrated herewith is manufactured by the Twin-Rim Company, 103 Massachusetts avenue, Bos-



The Twin-Rim Serving as an Auxiliary Wheel on a Ford Car.

ton, Mass. It is an auxiliary steel rim on which to mount a spare tire. Should a puncture or blow out occur on either the front or back tires, it is not necessary to change the tire on the road. Simply jack the wheel and place the twin rim beside it. The two are then made as one by tightening the bolts on four clinchers. This is done with a special wrench which is furnished with each rim. This device should appeal particularly to women motorists. The twin-rim is guaranteed to be strong and durable, and the purchaser has the privilege of testing the rim for 30 days. Should it prove unsatisfactory the purchase price of \$5 will be refunded.

"The Springs on Your Car" is the significant title of an unusually well prepared 64-page booklet which is being distributed by the Detroit Steel Products Company, Detroit, Mich. It is designed to answer the hundreds of questions that relate to springs on motor vehicles, and was written by an engineer who, though not connected with any spring manufacturing company, knows his subject thoroughly and writes for the layman.

HYPHENATED NUMBERS FOR NEW YORK.

SOMETHING new in number plates has been planned for New York state motorists in 1916 by Francis Hugo, secretary of state. Every number will carry a hyphen, separating the numerals indicating thousands from those indicating hundreds. Thus 20,411 will appear on the plate as 20-411.

It has been proved by experiment that numbers so separated are easier to grasp and are remembered more distinctly by the ordinary observer who sees them only for an instant than solid numbers.

There will be no numbers with six figures. These have been found very hard to decipher quickly. To eliminate them the state has been divided into three zones, one centering at New York City, one at Albany and one at Buffalo. Cars in the Buffalo zone will have the number preceded by the letter B, in the Albany zone preceded by the letter A, and in the New York City zone no letter at all will be used.

In order to make the numerals as large as possible the words "N. Y. 1916" have this year been placed under the numerals instead of at one side, as has previously been the case. Numbers from 1000 to 3000 have been reserved for dealers and from 3000 to 18,000 for commercial vehicles.

CRUDE OIL PRODUCTION LOW.

The rise in price of gasoline, which began when the large stores of crude tanked in the oil fields were exhausted, has been stimulated by the fact that when the wells again began to produce there was a sudden falling off in the volume secured from the great Oklahoma fields. The production of the great Cushing field decreased very decidedly. Some months ago Oklahoma crude was selling at 35 and 40 cents a barrel. As a result as little as possible was pumped and no exploration work or new wells were undertaken for many months. The price is now 80 cents, with corresponding increases in other fields and extensive work in developing new fields, and the drilling of new wells may be expected wherever there is a likelihood of oil.

OLDS IN FOREIGN MARKETS.

Taking advantage of the fact that foreign automobile dealers have not been able to get cars

since the war began, except from American makers the Olds Motor Works have been rapidly extending its overseas representation. It established a foreign department in July with W. von Zimmerman in charge. At that time it had dealers outside of the United States and Canada only in Cuba, Porto Rico and Hawaii.

Since then representation has been secured in Great Britain, Australia, New Zealand, South Africa, India, Norway, Holland and Japan, and transactions are pending in Central and South America, Denmark, France, Italy, Greece and Spain, as well as in the Asiatic countries. In spite of the fact that the British embargo on rubber applies to the shipment of American cars with tires to neutral countries and that ocean freight rates are high and fluctuate heavily, more



Hyphenated License Plate Designed for New York State for 1916.

progress has been made in a few months than could otherwise have been accomplished in years.

SPEED AND FUEL ECONOMY.

To test the effect of speed on fuel consumption, a Saxon Six, equipped with the standard Rayfield carburetor, was recently run at different speeds on Michigan avenue in Detroit with three passengers.

On the first run the car was driven from 20 to 22 miles an hour and averaged 18.2 miles per gallon of gasoline. On the second test the car was run from 15 to 16 miles an hour and showed a mileage of 21.9 miles per gallon.

This seems to indicate that with this car about 15 miles per hour is the most economical speed from the point of view of fuel consumption. Few drivers take the factor of speed into consideration when discussing the mileage they get from their cars and are disappointed when they do not get fuel consumption records while driving at high speed.

PRACTICAL FACTS FOR NEW CAR OWNERS.

Elementary Instructions in the Economical Operation, Maintenance, Adjustment and Repair of the New Car—Answers to Inquiries.

ENGINES that produce power and heat are generally classified in the two broad divisions of external and internal combustion types. In the first named the combustion of the fuel takes place outside of the engine, as in the case of the steam engine. In the internal combustion type the explosion of the fuel takes place within the cylinders.

It is the internal combustion type that is used in gasoline motor vehicle practise. Though its principle of operation is more than 200 years old, as related by historians of mechanics, its practical application to vehicles is of comparatively recent date.

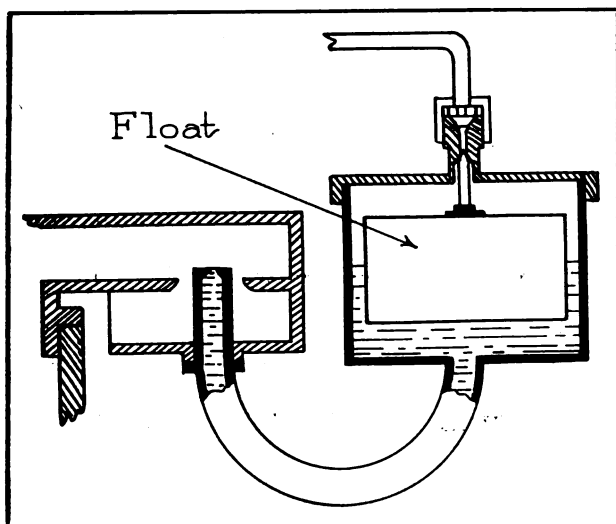


Fig. 1—Early Design of Float Construction in Carburetors.

The operating principle of the automobile engine is based upon the fact that gasoline vapor, or a fine spray of that fuel, mixed with air, forms a highly inflammable gas, which if compressed within an air tight chamber and ignited will generate power to force down a piston in the cylinder of an engine.

Gasoline is the most generally used fuel for motor vehicles. The same fuel is known in Europe as petrol, taking the name from crude petroleum from which it is derived. Another fuel used in foreign countries is benzol, a derivative of coal tar, and is produced in the manufacture of gas and coke. This fuel requires a special adap-

tation of carburetting apparatus and could not be used satisfactorily in the engine designed solely for gasoline use.

How Gasoline Is Obtained.

The general method of extracting gasoline from crude petroleum and to eliminate the many impurities present therein is to heat the crude stock in retorts to distill off its several products. These products are many and their purposes are varied. The first to be distilled are naphtha, gasoline and the other lighter constituents, which form approximately eight to 10 per cent. of the whole volume. The next products are light lubricating oils, of which kerosene forms a large proportion. After these come the heavy lubricating oils, and finally paraffin wax is obtained.

Up to the present no fuel has been developed in commercial quantities that gives such general satisfaction as gasoline, though chemists are constantly working to obtain a practical substitute, or at least a liquid that can be combined with gasoline. In this connection it might be added that the practise adopted by some motorists of combining gasoline and kerosene is generally condemned. This mixture may give good results for a time, but ultimately trouble will develop in the gasoline engine. This is because kerosene is not as volatile as gasoline and consequently part of it will accumulate in the carburetor until that component becomes completely choked.

The use of kerosene in an automobile engine has been found to be impracticable, though if it could be used it would cost less because of the greater quantities produced. In lessening the demand for gasoline it would have the tendency to reduce the price of that commodity. However, there are several disadvantages in the use of kerosene, the chief of which is the difficulty of vaporization. To be of value as a fuel it must be raised greatly above normal in temperature to obtain satisfactory vaporization.

Kerosene Contains Carbon.

- Kerosene contains much carbon in its composition, and carbon deposits quickly accumulate on the cylinders. Although there should be no difficulty in using the fluid in slow running engines, it would appear that there would be dif-

Explanation

Explanation is the transference of knowledge and is the result of occupation or interest.

The salesman explains the motor car he represents as an occupation, for which he is paid, and derives his inspiration from his commissions. Explanation of real unbiased value comes from the enthusiasm of a purchaser; from the friend who has bought and who gets his or her inspiration from the after-purchase value of the vehicle.

Scripps-Booth

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The standing of these enthusiasts in their respective communities makes this explanation-enthusiasm a puzzle to those accustomed only to the standards of the old type heavy roadsters. Our dealer can show you why.



Roadster \$775



Coupe \$1450

Scripps-Booth Co
Detroit, Mich.

ficulty in obtaining sufficiently rapid volatilization for modern high speed types.

It seems to be the consensus of opinion among persons generally credited with being authorities on the subject of motor fuels that the fuel that will be commonly used in the future is alcohol. If this comes to pass the cost of motor vehicle operation should be greatly reduced, because alcohol is to be found to a certain extent in every form of vegetation. It could be produced in every country in the world, and not be confined to certain centres, as in the case of crude petroleum.

However, alcohol at present has its disadvantages, the foremost of which is its heat efficiency, a vital factor in its use in connection with engines designed for gasoline. Taken weight for weight, the heating value of alcohol is about 0.6 that of gasoline, and according to the experiments of a professor of a well known university, it would require, everything else being equal, 1.8 times as much alcohol as gasoline per horsepower hour.

Still another disadvantage is that alcohol has a higher vaporizing point and would therefore require the heating of the carbureting apparatus. It would also be easier to consume an excess of alcohol without detection as compared with gas-

oline. Nevertheless, considering all conditions, gasoline and alcohol come nearer being adaptable to the same purposes than any other known combustible fluid.

It has been found that alcohol vapor can be

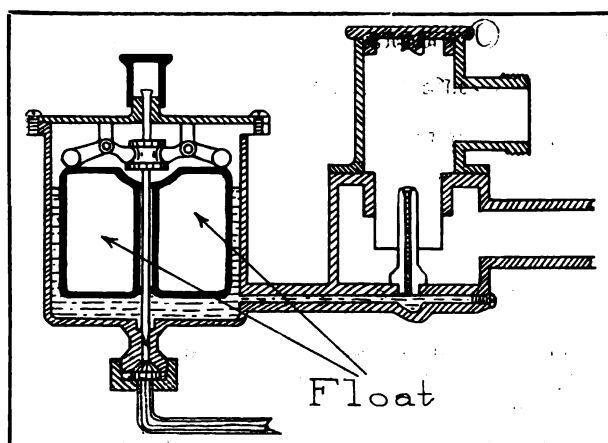


Fig. 2—The Balanced Float in Modern Carburetors.

compressed to a higher degree before it will ignite than can gasoline. This factor tends to offset the discrepancy in relative heating values, and while it must be admitted that alcohol contains a smaller amount of heating units, the efficiency

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obtained is greater since the higher degree of compression compensates for the difference in the amount of heat units per pound.

Alcohol Is Cleaner.

Alcohol should by far be the cleaner of the two fuels, and it also would require less air to perfect combustion. The following table shows the elements of which the two are comprised:

Elements	Gasoline Per Cent.	Alcohol Per Cent.
Carbon	84.3	41.5
Oxygen	0.	45.5
Hydrogen	15.7	13.0

It will be noticed that gasoline contains more than twice as much carbon as alcohol, and that the latter also contains 45.5 per cent. of oxygen, while the former contains none. The existing conditions are, however, unfavorable to the use of alcohol at this time and are in favor of the use of petroleum products.

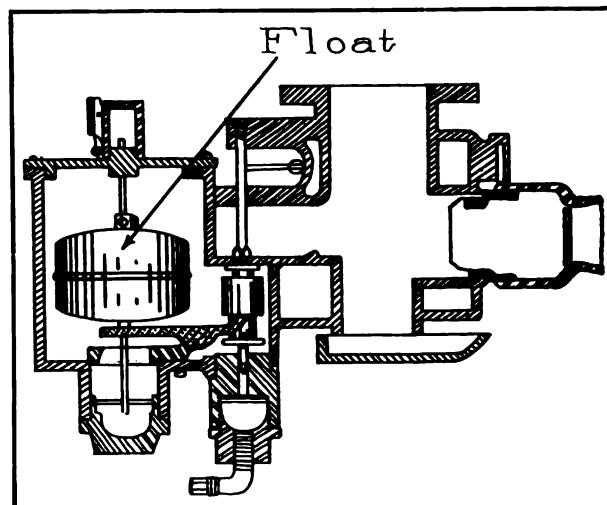


Fig. 3.—Another Popular Design of Float Construction.

Next for consideration is the carburetor, where the gasoline is prepared for combustion. It can well be called the heart of the motor, for upon its perfect and continued functioning depends the successful operation of the engine. A poorly functioning carburetor, due to whatever cause, can bring about a larger number of troubles than any other part of the power plant. Among these may be mentioned overheating, missing, backfiring, carbonization and several other conditions with which nearly every motorist is more or less familiar.

Carbureting devices may be divided into three general classifications: The bubbling, the surface and the spraying types. The first two are today practically obsolete in motor vehicle construction. In the spraying type, the fuel is first

reduced to a fine spray and then mixed with the air to become vaporized during the passage from carburetor to the combustion chamber.

The Float Feed Type.

The most generally used carburetor is of the float feed type, in which a constant level of fuel is maintained in a jet or standpipe by means of a float in an auxiliary chamber. This type really has two chambers, in one of which is the float, and in the other the spraying jet, which is in direct communication with the engine.

An early design of float construction is shown in Fig. 1. This type could be used with good results on stationary engines, but not with an engine designed to propel a vehicle, because its action is very uncertain and it is sensitive to great vibration and changes of levels. This trouble has been overcome in present day construction by incorporating efficient means for balancing the movement of the float. An example of this is shown at Fig. 2.

The action of the device is easily traced. The fuel enters the bottom of the chamber where the float, an annular hollow metal type, is located. The needle valve is of separate construction and operates through the centre of the float by a combination of toggle levers. The gasoline entering the chamber raises the float, which presses against the ends of the levers, and they in turn gradually force the needle valve into its seat, which shuts off the fuel supply.

In the next installment the construction of different types of carburetor will be discussed.

READERS' QUERIES.

A Misfiring Motor, Wiring of Splitdorf Coil, Cleaning and Adjusting Vibrator Coils, Different Types of Axles, How to Test Oil.

Motor Misfires—B. B. G., Lewiston, Me.

About a month back I received a 1912 Reo touring car to repair, but after all my efforts it continues to miss on cylinders two and three. This is not a steady miss, but occurs especially when pulling or running at high speeds. I returned the carburetor to the factory and they guarantee it to be in perfect condition. I have changed the plugs around and overhauled the magneto, but cannot remedy the trouble. I would be thankful for any suggestions which you may have to offer.

Are the magneto magnets fully charged? An efficient magnet should be capable of lifting a 15-pound steel or iron weight. Are you certain that the north poles have been placed together? The 1912 Reo used a National magneto, which is equipped with five carbon brushes in the distributor. Examine these brushes to determine that

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NO matter how cracked or full of pin holes your top is, you can make it absolutely waterproof for a whole season by applying

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Contains no varnish, shellac, oil or asphaltum, so that it makes the fabric more flexible and durable.

Water positively cannot penetrate or even get a foothold on a fabric treated with Never-Leak. It sheds water as easily as a duck's back. This dressing being colorless, fabrics undergo no discoloration.

Silks, cottons or other fabrics made water proof without stain or stiffening.

If your dealer doesn't sell Never-Leak, send us his name or write direct. Put up in ready-to-use cans, quarts \$1, half gallon \$1.75 and gallon \$3. Quart will cover roadster top and half gallon will cover 5-passenger touring car top.

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is not leather, yet has the luxurious appearance and feel of the finest grain or Spanish leather. It is water, dust and grease proof and twice as strong as coated splits. It is guaranteed for one year, but built to last for many. And back of this sincere guarantee stands the century-old Du Pont reputation for integrity of purpose, superiority of product and financial responsibility.

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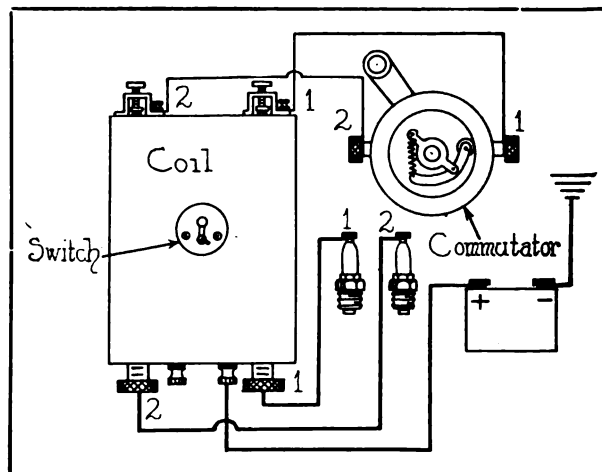
J. H. Sager Line.

they bear upon the distributor arm. It may be that one or more have weak springs. If the car has been used extensively it may be that the valve guides have become badly worn, so that a large amount of surplus air is drawn in with the mixture. When this condition exists the motor will fire very weakly, and often not at all. Several kinds of material can now be bought for packing valve guides. You should also be sure that the valve caps and plugs do not leak around the threads.

Wiring of Splitdorf Coil—F. L. Paterson, N. J.

Being a constant reader of your journal I would like to take advantage of the correspondence department. I have an old two-cylinder Maxwell runabout which is equipped with a Splitdorf coil. Recently I removed the coil from the car, but have forgotten the correct wiring for it. Can you print a small wiring diagram of the wiring?

The coil used on the two-cylinder Maxwell car is of the vibrating type. No magneto is used.



Wiring Diagram of the Splitdorf Coil.

Assuming that the ignition current is supplied by a storage battery, the wiring is similar to that shown in the accompanying illustration. The negative wire leading from the battery is grounded on the frame of the car. The positive wire leading from the same source is attached to the right hand terminal underneath the coil box. The wires leading from the commutator are then fastened to the posts at the top of the coil. The terminal for the No. 1 cylinder is at the right hand side and No. 2 at the left. The cable leading to the spark plug in No. 1 cylinder should be attached to the lower terminal, marked No. 1, and the cable for the other plug should be attached to the other lower terminal, marked No. 2.

Cleaning and Adjusting Vibrator Coils—B. R. T., Washington, D. C.

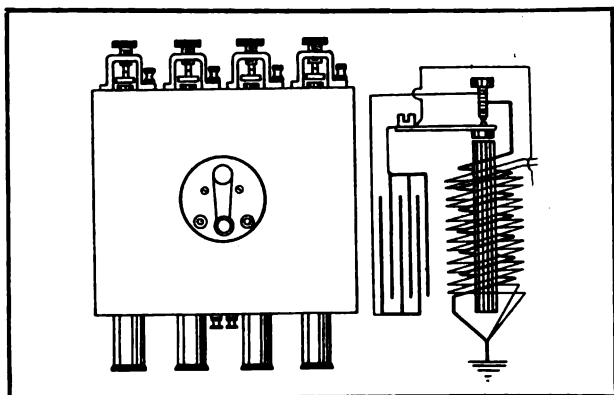
The vibrating coil is somewhat of a mystery to me.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

Will you please tell me what I should do to obtain the fullest possible service from it?

Correct adjustment and cleanliness of the contact points are of prime importance in obtaining full efficiency from the vibrating coil. Some types are provided with points made of platinum, and others of high-grade steel. In both cases the usual way to clean them is to scrape or file away such matter as may have accumulated. On the platinum points, however, it is advisable to use a very fine file, for this metal is very valuable and it is very easy to remove more than is necessary to obtain the desired results.

The accompanying diagram shows a rough sketch of a coil, and illustrates the method of getting at the contact points. The bridges spanning each point can be removed by unscrewing the screws that hold them to the block. In the same manner can the trembler blade be removed. The removal of the blade will expose the top of the soft iron core, which alternately attracts and



Sketch Illustrating How to Clean and Adjust Vibrator Coils.

repels the trembler blade as the current passes through. If this core is found to be rusty it should be cleaned with emery cloth and then smeared lightly with grease.

If the vibrator spring, or trembler blade, has lost its elasticity, it should be replaced. Some repairmen obtain good results, however, by bending the blade. If the contact points are worn or loose they can be renewed by any reliable jeweller. In adjusting the points the operator should manipulate them until they give off a very high and musical note in operation.

Right Side Driven Ford Cars—G. H. D., Danielson, Conn.

Can you tell me if the small Ford cars were ever driven from the right hand side, and if so, in what year was the change made to the present left hand side?

The small Ford cars were originally driven from the right hand side. The change to the present left side drive was made in 1908.

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to run your Ford this winter without a limousine top like this? The price is only \$60-Complete.

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Weed Chain Tire Grip Co., Bridgeport, Conn.
In Canada:—Dominion Chain Company, Limited, Montreal, Canada



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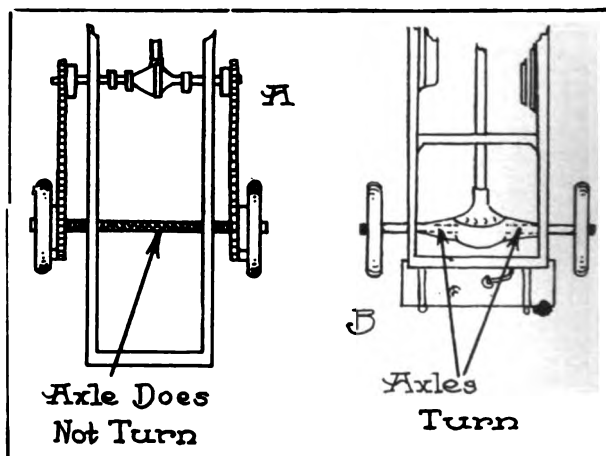
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Axles, B. J. G., Tampa, Fla.

What is meant in referring to rear axles as live, dead, floating and semi-floating?

A dead axle serves no other purpose than to support the weight of the vehicle and act as a pivot for the wheel. It does not revolve and is to be found on cars on which the double chain drive is used. This type is illustrated at A. The live axle does turn and is to be found on all cars using the shaft drive. It is the medium which supplies the motive power to the wheels. An illustration of this is shown at B.

The live axle is classified in three types: Floating, three-quarter floating and semi-floating. The first type, as the name indicates, floats and carries no weight. The rear wheels rest upon bearings which are fitted to the outside of the housing, the axle being used merely to supply the rotary motion. The axle could be removed and still the car would be able to coast down a grade or could be towed. The end of the shaft



Illustrating the Different Types of Axles.

has a form of clutch which fits into depressions in the wheel hub. This connection between the shaft and wheel is flexible. The three-quarter floating type is permanently attached to the wheel, usually by bolts.

The semi-floating type of rear axle is a departure from all other types. It rests on bearings inside the housing and the axle bears the weight of the load. The end of the axle is attached to the hub of the wheel by a key and is locked there usually by a nut and cotter pin.

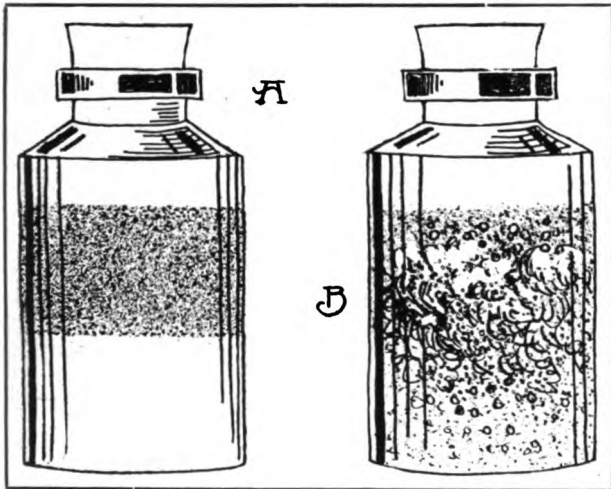
Spark Knock—R. S. H., Oakland, Cal.

In a previous publication of the Automobile Journal I read something about knocks caused by an advanced spark, but can you explain more fully how this effects the motor?

A spark knock is the result of preignition of gases in the cylinders. If the spark could be produced at the instant of full compression, regard-

less of motor speed, there would be no need of a spark lever. However, this is not the case. The current has to be transformed from low voltage to one of higher potential, and this operation always requires the same amount of time, whether the motor is running at low or high speeds. Therefore to allow for this transformation when the motor is running at high rates of speed, it is necessary to advance the spark lever so that the ignition will take place as near dead centre as possible.

When the car is climbing a grade it will be seen that the number of engine revolutions will be greatly decreased, and thus the spark lever should be retarded in accordance with the speed. If the spark is left fully advanced the charge is ignited too early, and if the momentum of the flywheel were not sufficient to carry the piston



A Simple Test to Determine Quality of Oil.

over centre, the engine would reverse.

The knock is the result of the expanding gases striking the piston before it has completed its compression stroke. The accompanying illustrations show how the action takes place.

Oil Test—C. A. R., Hartford, Conn.

I am told that the quality of an oil can be determined by mixing it with water. Is this correct, and if so what does it indicate?

This is a practical test for ascertaining the quality of oil. It is commonly referred to as the emulsion test. The Platt & Washburn Refining Company, New York City, advises the following procedure: Select a bottle which is absolutely clean and into it pour one-third water and a like quantity of oil. Cork the bottle and then shake vigorously for about a half hour. The solution should then be allowed to stand for 24 hours. If the oil is of good quality and free from acids, the

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lubricant should appear clear at the top and the water clear at the bottom, as shown in the accompanying illustration A. Should sulphuric acid compounds be present in the oil it will be indicated by a curdled mass floating upon milky water. The curdled matter is a form of sulphuric acid soap and the amount present denotes the quantity of impurities. This condition is shown at B.

Principle of Sliding Gear Transmission—B. N., Troy, N. Y.

I recently purchased a light truck equipped with a sliding gear transmission. Although I have at hand a diagram of the mechanism, I cannot see how it is possible to place another gear in mesh when there are two that are permanently engaged. Kindly explain this.

In sliding gear construction the shaft has four keys milled on its surface. Corresponding slots in the gear fit the keys. A departure from this is the use of a square shaft instead of one having keys. In both types the gear is free to move longitudinally, but is controlled by a collar and yoke arrangement which in turn is controlled by

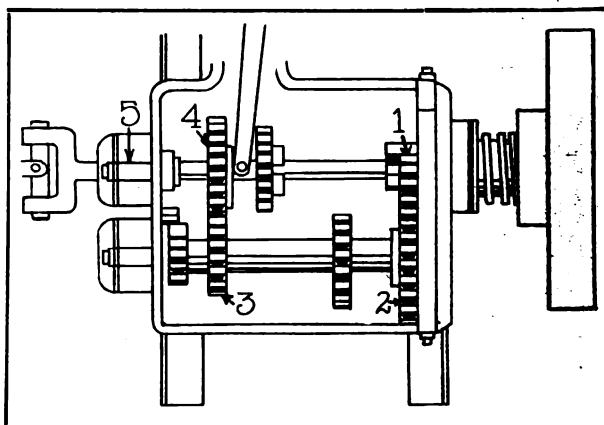


Diagram Illustrating the Principle of the Sliding Gear Transmission.

a lever operated by the driver. The accompanying sketch illustrates the principle.

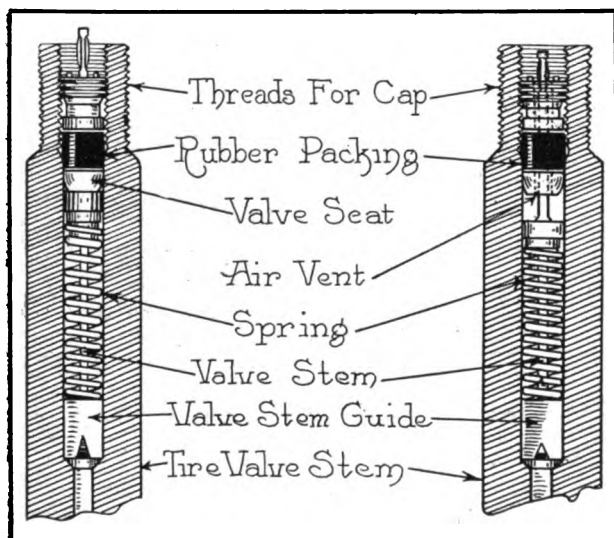
This transmission is of the progressive type. The upper shaft retains the sliding gears. The permanently meshed gears are those indicated by 1 and 2. The upper gear, however, is not attached to the shaft carrying the sliding gears, the shaft being machined at the end and merely fitting freely into a bushing. The low speed of this transmission is now engaged and the drive is as follows: The engine has a direct drive to the gear 1, which being permanently in mesh with the gear, 2, drives the lower shaft. The gears on this shaft are securely fastened, thus the gear marked 3 must revolve. This gear communicates the action to gear 4, which consequently compels the shaft to turn and transmit the action to the drive shaft, 5.

TIRE VALVE TROUBLES.

When the tire valve goes wrong a surprisingly large number of motor car owners are helpless to put it into working condition again. Yet this important little component is simple in construction and principle.

For the benefit of those who do not understand the valve principle thoroughly, the accompanying illustration showing a valve open and one closed, and the following explanation of its operation will be found illuminating.

It will be noted that the inside of the valve stem is recessed and threaded at the upper end, into which the valve is screwed. At the base of this recess is a shoulder on which the valve stem guide rests. An air passage directly below this guide leads into the tube. At the base of the threaded portion is another seat, on which rests a



Cross Section View of a Tire Valve.

rubber packing. The threaded member of the valve which screws into the stem is hollow, thus allowing the plunger rod to move freely. A cup shaped piece of metal to which the rubber packing is attached fits into the threaded section and both move freely.

This arrangement allows the adjustment of the packing by screwing down on the threaded member. When in position these two parts form a long bearing for the plunger. Attached to the middle of the plunger is a cup like piece of metal to the base of which is attached a fine spiral spring. The guide attaches to the other end of the spring.

The illustration at the left shows a properly adjusted valve which is absolutely air tight. The valve is fully on its seat and the air vent sealed.

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(Signed) WM. H. BLACK, Member of Firm.

Sworn to and subscribed before me this 7th day of October,
1915.

(Signed) MICHAEL F. COSTELLO, Notary Public.

(Seal) (My commission expires June 30, 1917.)

THE MAGAZINE FOR THE TRADE ACCESSORY & GARAGE JOURNAL

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In the illustration to the right the plunger has been depressed to force the valve away from its seat to allow the air to escape through the vent. When the pressure is released from the plunger, the spring forces the valve into its normal position.

When inflating a tire the action is automatic. The incoming air has greater pressure than that already in the tire and forces the valve down. When the incoming pressure is shut off the compressed air in the tube reseats the valve.

Valve trouble may be the result of several conditions. A frequent cause is that the rubber packing has lost its elasticity or has become torn through careless adjustment. Often foreign matter will lodge between the valve and seat. Depressing the plunger a few times will sometimes dislodge it.

The tip of the valve stem cap is usually so formed that it can be used as a wrench for adjusting the rubber packing to its seat.

APPLICATION OF BRAKES.

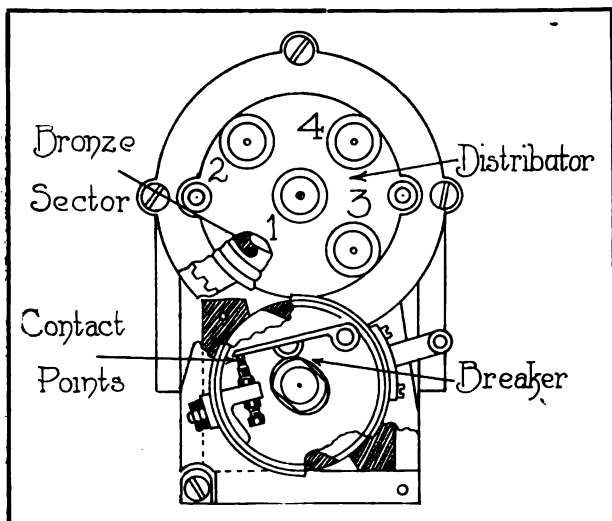
A good brake will immediately stop the rotation of the driving wheels, even though the car may be running at a speed of over 40 miles. While in a case of an emergency it is necessary to apply the brake in such a manner, yet for ordinary stops, the distance should be so judged that the car may be brought to a stand still with but slight appliance of the brakes. The street car running with what is commonly termed a flat wheel is the result of too sudden braking, and when it is considered that steel will be worn flat on a smooth rail, it will be readily understood what the result is on soft rubber when it is dragged over a gritty road surface.

An experienced driver will shut off the power at a reasonable distance from the stopping point and allow the momentum of the car to carry him along, exercising a slight pressure on the brakes until finally the car is stopped. While it is necessary to have the machine under control at all times, it is a good practise to avoid the use of the brakes when other means may be resorted to. This is true when coasting down a hill, as the ignition switch may be turned to the off position and the clutch allowed to remain in. This affords an effective check on the speed of the car, as it must run against compression in the cylinders. It is, however, necessary that the throttle be opened widely so as to allow a large volume of mixture to be compressed. When the base of the hill has been reached the switch may be turned on and the motor will instantly start.

TIMING MAGNETO.

Should it happen that the magneto is removed from its base and the coupling not marked, it will be necessary to retime the instrument before successful operation of the motor can be resumed. The method of timing is as follows: Securely fasten the magneto to its base on the motor, and then turn the engine over until the piston of the first cylinder (the one nearest the radiator) reaches its highest point on the compression stroke. Connect the control rod leading to the steering post to the magneto advance lever and then retard the hand lever to the extreme limit.

Revolve the armature shaft by hand in the general direction of its rotation until the bronze sector of the distributor is almost opposite the brush marked No. 1 in the accompanying illus-



How Magneto is Timed.

tration. This brush supplies the current to the first cylinder. Turn the armature shaft a trifle more until the cam breaker contacts with the roller on the breaker bar and begins to separate the platinum points. This is the point when a positive connection should be made to the engine.

The novice should not be deceived by the differing speed and direction of travel of the distributor to that of the armature shaft. The reason for this is that the armature usually operates at engine speed, which necessitates a reduction of one-half in the distributor. This is accomplished by gearing the distributor to the armature shaft, the gear of the former, of course, containing twice as many teeth as the gear of the latter.

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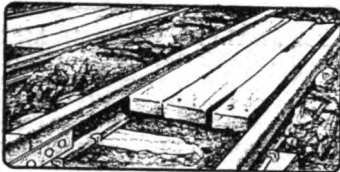
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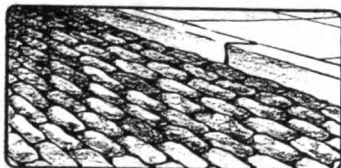
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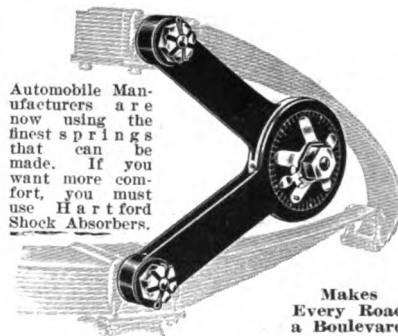
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Index to Advertisers.

	Page
Ahlberg Bearing Company.....	58
Barrett Manufacturing Co.....	63
Bosch Magneto Company.....	55
Coes Wrench Co.....	7
Culver-Stearns Mfg. Co.....	57
Dixon Crucible Co., Jos.....	62
Dort Motor Car Co.....	9
Dover Stamping & Mfg. Co.....	60
Eagle Oil and Supply Co.....	2
Eisemann Magneto Co.....	63
Harris Oil Co., A. W.....	58
Hartford Machine Screw Co.....	61
Hartford Suspension Co.....	1
Heinze Electric Co.....	56
Inter-State Motor Co.....	56
L. W. S.....	2
Marburg Bros.....	62
McQuay-Norris Mfg. Co.....	62
Mea Magneto Co.....	62
Mecca Mfg. and Spec. Co.....	2
Metz Company.....	57
New Departure Mfg. Co.....	56
Nordyke & Marmon Co.....	63
N. Y. & N. J. Lubricant Co.....	62
Peerless Motor Car Co.....	57
Pierce-Arrow Motor Car Co.....	Cover
Reo Motor Car Co.....	Cover
Scripps-Booth Co., The.....	53
Splitdorf Electrical Co.....	60
Springfield Metal Body Co.....	Cover
Standard Oil Co., The.....	59
Staybestos Mfg. Co., The.....	55
Stutz Motor Car Co.....	3
Superior Mfg. Co., The.....	60
Texas Oil Company.....	63
Thermoid Rubber Co.....	56
Times Square Automobile Co.,	2
Valvoline Oil Company.....	63
Vanderpool Co., The.....	2
Weed Chain Tire Grip Co.....	10

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VOL. XL.

NOVEMBER 25, 1915.

NO. 8.

PUBLISHER'S AND READERS' PAGE.

A SEASONABLE Suggestion—When making up the list of Christmas gifts this year it is well to remember that for those among your friends who are interested in motor vehicles, there is nothing that they would appreciate more than to receive *The Automobile Journal* during the next year. Or a gift of equal value would be to have the Publisher send them a complete set of *Automobile Mechanical Books*, described on page 64 of this issue. This set is authoritative and comprehensive and will supply the recipient with practical information that will last a life time. Either one of these propositions can be arranged with minimum trouble for the giver—simply send in the amount of the subscription or the purchase price of the library, together with the name and address of the person to whom they are to be sent, and the Publisher will attend to the details promptly. This matter should be attended to at once, so that acknowledgments may be made before Christmas day.

Prospective Purchasers of motor vehicles during 1916 will find the Annual Show Numbers of *The Automobile Journal* of material assistance in making a selection. Those not intending to buy this next year can at least keep abreast of the trend of design as it is being worked out in the engineering departments of the automobile companies. These numbers will present in detail the prices, seating capacities, mechanical specifications and equipment of every car manufactured.

New Accessories and Equipment will be dealt with extensively in the Show Numbers. The makers are keeping pace with motor car developments and during the next few months several remarkable devices are expected to make their appearance on the market. It is the policy of this magazine to give impartial and accurate analyses of accessories and equipment as they are announced by the makers, and these descriptions are one of the features for which the editors have received wide commendation. If any reader is interested in any particular

article described and wishes more exhaustive information the Editor of *Mechanics* will be glad to furnish it promptly, or will obtain special information from the inventor or manufacturer of the device. However, the name and address of the maker is always given with the editorial description, so that inquiries can be sent direct so as to save time for the inquirer.

Partial Table of Contents.

	Page
*Truck Opens up Wilderness.....	11
Speed and Danger Unrelated.....	16
Lincoln Highway Progresses.....	17
*General News of the Industry.....	19
*Motor Starting and Car Lighting.....	23
*Providence Automobile Show Successful	28
*New Overland Four, Model 75.....	29
*The Allen Four-Cylinder Chassis.....	33
Five Million Cars in 1920.....	36
*The Cutler-Hammer Magnetic Gear Shift	37
English Tariff Affects Canadians.....	39
*Industrial Happenings and Comment...	40
*Car Accessories and Equipment.....	41
*Practical Motor Car Repairs.....	43
*Suggestions for the Ford Car Owner....	45
*Ford Car Accessories and Equipment...	49
Motor Car Beats Railroad Train.....	51
*Practical Facts for New Car Owners....	52

*Indicates article is illustrated.

The Bosch Lighting System is thoroughly discussed in the installment of the *Motor Starting and Car Lighting* series in this number of the magazine. This is the ninth of the series, which was begun in the July 25th issue, and is one of the most important of all the systems described. The descriptions will be continued until all the systems employed in modern automobile practise have been discussed. At the conclusion, the series will form one of the most valuable collections of information relating to the subject that has ever been prepared. Consequently, every reader should save the copies of the magazine in which the descriptions appear.

The Practical Motor Car Repairs department continues to hold the interest of the subscribers, as is shown by the many letters received by the Editor. The majority of writers state that the department contains just the kind of information that they want, and several have offered suggestions that are quite valuable. That a great many of the readers are alive to the advantages offered them in the Correspondence Department is shown by the numerous queries received. This department is open to every subscriber, who can obtain information that will not only

enable him to overcome the particular difficulty that bothers him, but also enables him to accomplish this in the most economical manner. When writing for information be sure to give all the necessary data regarding the component under discussion, such as the correct name of the maker, the model, the year of manufacture, the car with which it is used, etc.

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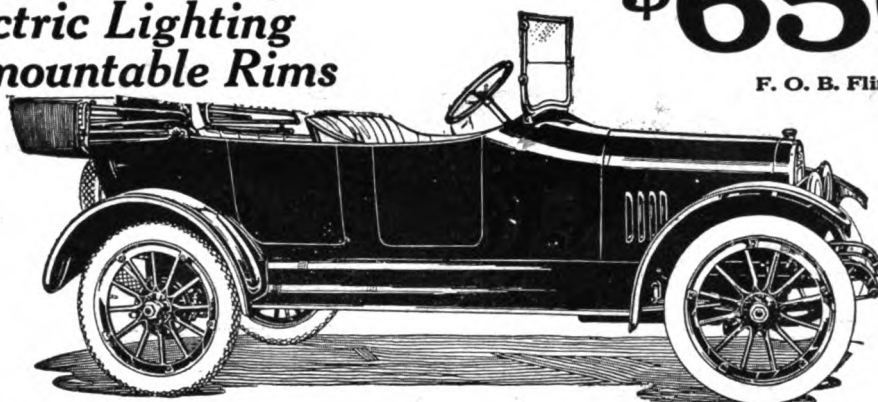
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THE AUTOMOBILE JOURNAL

VOL. XL, No. 8

NOVEMBER 25, 1915

Price, \$1.50 the Year

TRUCK OPENS UP WILDERNESS.

Thousands of Tons of Material for Big Dam Carried Through Maine Woods—Savings Through Motor Transportation, Paid for Road.

IN THE building of a great dam in Ripogenuous gorge, in the wilderness of northern Maine, one of the greatest problems faced by the engineers was that of hauling material 50 miles from the railroad to the dam site. The country is wild and mountainous. To build a railroad would cost from \$15,000 to \$40,000 a mile, and after the dam was built it would be useless, as development of the country which would make it a permanent investment is not to be expected.

If horses were used it would be necessary to build a road 40 miles long to Lily bay, on Moosehead lake, where it would meet a ferry, at a cost of \$250,000. To do the necessary hauling and provide supplies for the teams 110 four-horse teams would have been required.

As work can be carried on only for six months of the year, owing to the severe

weather, the horses would have to be sold every fall at a loss and bought again in the spring, or they would have to be wintered at a cost practically equal to their support while they were working.

Build Road for Trucks.

After a careful study the engineers decided to build the same road that would be required for horses, but to operate nine five-ton White trucks upon it.

The dam is not far from Mt. Katahdin and, between that mountain and Moose head lake is a country that is practically inaccessible and has seldom been penetrated, except by hunters and fishermen. The purpose of the dam is to form an enormous storage reservoir, which will be 25 miles long and will contain 21,500,000 cubic feet of water.



Starting the Big Descent, Where the Loaded Trucks Are Lowered a Quarter Mile by a Cable and Mechanical "Snubber."



Construction Camp Below the Dam.

The task is being performed by a large corporation operating a number of paper mills. The object is to hold the water back in the spring so that it can be released gradually through the summer, permitting an even flow past the mills in order that they can operate constantly. The company also cuts timber in the Maine woods, which is used for wood pulp. This is floated down stream to the mills. In the past it has been possible to use that means of transportation only in the spring, when the water is high, but the dam will make it possible to float down logs throughout the summer.

There was an old road, originally an Indian trail, and later a "tote" road of the lumbermen, from Lily bay on Moosehead lake, a distance of 38.5 miles to the dam. This was usable for sledges in the winter, and sledges could be used over it also with light loads in the summer time.

If this were used in its unimproved condition a four-horse team with a sledge could probably not haul more than a ton in the summer time. In view of the large volume of material to be moved—50,000 barrels of cement, weighing more than 10,000 tons, steel, metal and different kinds of machinery and tools—sledging was impractical.

The dam is 1000 feet long, 80 feet high and

thick enough to hold back water for a distance of 25 miles. The road was surveyed with a view to such improvement as would enable motor trucks to be used and the cost was set at \$250,000. Railroads could be used to Kineo and the material ferried over Moosehead lake to Lily bay and there transferred to the trucks.

Cost \$7000 a Mile.

The cost of the road was set at slightly more than \$7000 a mile. The plan called for a roadway of crushed stone wherever necessary, with a high crown and side drainage ditches. It was to be of such width that one vehicle could use it easily and two could pass if very carefully driven.

The engineers figured that a truck on this road could make at least 77 miles a day, carrying five tons. A team of four horses could make two round trips a week, averaging $3\frac{1}{2}$ tons. It was necessary that the supplies should go forward rapidly enough to keep the large force at the dam well supplied at all times. With nine trucks this volume of material could be moved. To move the same volume 90 horse teams would be required, and in addition each eight teams would require an additional team to haul hay and horse supplies. The work would be so hard that some relief for the horses must be provided and that would add more teams.

Too Severe for Horses.

The expense of the road would be practically the same whether horses or trucks were employed. But nine trucks would cost less than 25 per cent. of the amount that would be required to buy sufficient teams and wagons to do the work. This difference would pay for a large part of the initial cost of the road. In the six months when the trucks were not working the only cost would be interest on the investment—there would be no operating expense, while horses would cost almost the same whether



The Foot of Ripogenous Lake. Where the Dam 1000 Feet Long and 80 Feet High Is to Be Constructed, Showing the Bridge and Temporary Work Where the Dam Will Be Built.



Filling Radiator with Water at a Roadside Supply Station—Note Sharp Crown of Highway Surface.

they were idle or were being worked.

The annual saving on animal upkeep was expected by the engineers to pay the remainder of the cost for the road. The work was authorized on that basis.

Scows on the Lake.

A fleet of scows was built to ferry material to Lily bay, and steamers for towing were obtained. Headquarters were established at Lily bay, and from that point the old tote road was gradually transformed last year by a gang of several hundred men. A minimum of grading was done through considerations of economy. Crushed stone was used for the body of the roadway. The surface coat of screened stone and the rolling which is usual on similar public highways was omitted. The engineers depended on traffic to do the rolling.

What was essential was a surface that would drain well and would be of sufficient depth to endure under traffic and stand the disturbing conditions of the long Maine winter, which usually lasts five months of the year. To build the road

took all of last season and there was still considerable to be done when the weather opened up, so work was possible this spring.

Nine five-ton trucks were ordered from the White Company at its Boston branch, and the trucks were on hand ready for use the first of the year. It was impossible to put them to work, however, until May. The road was new and not yet settled, so it was necessary to establish repair camps along the run this year and keep out crews of men whose work was to see that the roadway is always in shape for the passage of the trucks day or night.

The trucks went to work on a schedule that required one round trip of 77 miles in 10 hours. The drivers were paid a daily wage of \$3 and a bonus of four cents a mile for each additional mile driven over 77. The freight was handled from the ferries on mechanical conveyors to make the loading as rapid as possible, and the trucks seldom take much more than 10 minutes to put on their five tons. Unloading at the dam when possible is done by the same means.

Drivers Taught in Boston.

The men employed were sent early in the year to the White branch in Boston, where they were given a thorough training in driving and repairing trucks, so that they could be relied upon to handle their own machines and make all repairs and adjustments that were necessary.

In actual use it has been the practise to work the trucks and drivers 16 hours a day—the trucks covering about 120 miles and making usually two round trips. It is frequently impossible for each truck to spend the night at one of the terminals of the haul, so the men are given a bed and food at one of the road side camps. Their pay with the extra mileage bonus amounts on an average to \$33.50 a week.



Pier at Lily Bay, Moosehead Lake, Showing a Load of Cement Being Transferred from the Scow Boat to the Wharf and to the Truck at the Terminal of the Road to the Dam.



Truck Ditched at the Roadside in Trying to Pass Another Machine on the Narrow Way.

The trips are made over the length of the road with as few stops as possible. They carry capacity loads to the dam and usually return light. Care is taken that they shall not be overloaded.

Leaving Lily bay the road has a constant grade of about five per cent. for some miles, on which the machines are driven in low gear at a speed of about five miles an hour. Two miles further the divide between the Kennebec and the Penobscot rivers is reached and then there is a descent so steep that no vehicle can safely be driven down it. The grade is a quarter of a mile long and both the trucks and such wagons as are in use are lowered by a steel cable attached to a mechanical "snubber" that is operated by a single man. Returning with lighter loads or empty the trucks climb the grade on low gear.

The remainder of the road winds about a great deal, with numerous short grades. These will average about five per cent. It is necessary to use speed changes and emergency brakes. The surface of the road is smooth and free from unevenness, but it is so narrow that trucks are often ditched in trying

to pass. Loaded the trucks run 12 miles an hour on the level, less when low gear work is necessary, and as high as 15 miles on down grades when the road is clear. When light the machines are driven from 10 to 15 miles per hour.

Fast Driving Desired.

The mileage bonus is a stimulus to fast driving, but the necessity of moving as much material as possible overcomes, in the company's opinion, any injury that is likely to be done to the trucks or tires. The day's mileage is large and is continuous. The trucks are idle only when the drivers are sleeping.

Practically all adjustments and minor repairs to the trucks are made during the short stops, when loads are being taken on or put off.

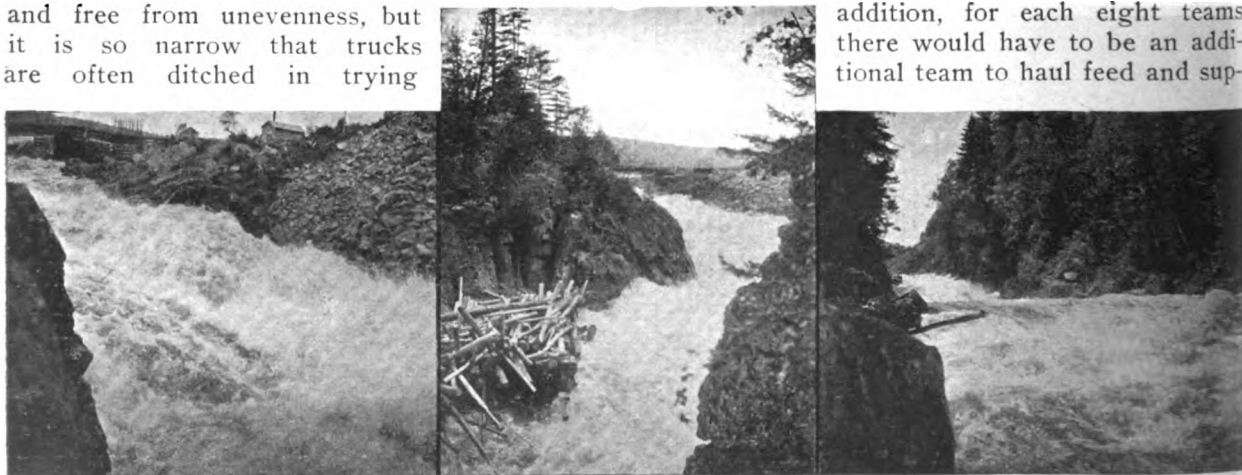
Long distance hauling is, of course, the most favorable condition for the trucks as compared to horses in the matter of cost. The long hours worked on this job increase the economy of using trucks.

The cost of a high-grade, four-horse team with wagons, harness and equipment is about \$2000. Such a team working to capacity could make two round trips a week with loads of $3\frac{1}{2}$ tons. This would require a mileage of 25.66 per day.

Too Severe for Horses.

This work would be too severe for the horses to do regularly without relief. It would result in moving seven tons a week.

A truck does two round trips a day with five tons, or 70 tons for the week of seven days. This is 10 times the capacity of a single four-horse team. There would have to be a number of reserve teams for relief work. In addition, for each eight teams there would have to be an additional team to haul feed and sup-



The Ripogenous Gorge Below the Dam Site: At Left, the Beginning of the Gorge; at Centre, the Rapids at Mid-Summer; at Right, the River Churned to Foam.



At the Foot of the Big Descent, Where the Wire Cable Is Cast Off and the Truck Can Be Driven Safely.

plies. The complete horse outfit would consist of 450 horses and 101 drivers, to say nothing of stable help, and there would have to be large barns at each terminal, and at different places along the road.

The cost of horse equipment would amount to \$200,000, and the cost of 125 drivers and stable men at \$1 a day would be \$125 a day, or \$875 a week. The cost of keeping the horses in good condition would be \$1 a day each, or \$3150 a week, which would bring the total horse costs to \$4025 a week. This includes interest, taxes, depreciation, insurance and the like. For six months the horse costs would go on with very little reduction while no work was done.

The cost of the nine trucks is approximately \$45,000. The drivers average \$33.50 a week and each is accompanied by a helper. The shop equipment with which repairs are made at the dam does not represent additional investment, for it is necessary in keeping the tools used in

construction work in good condition.

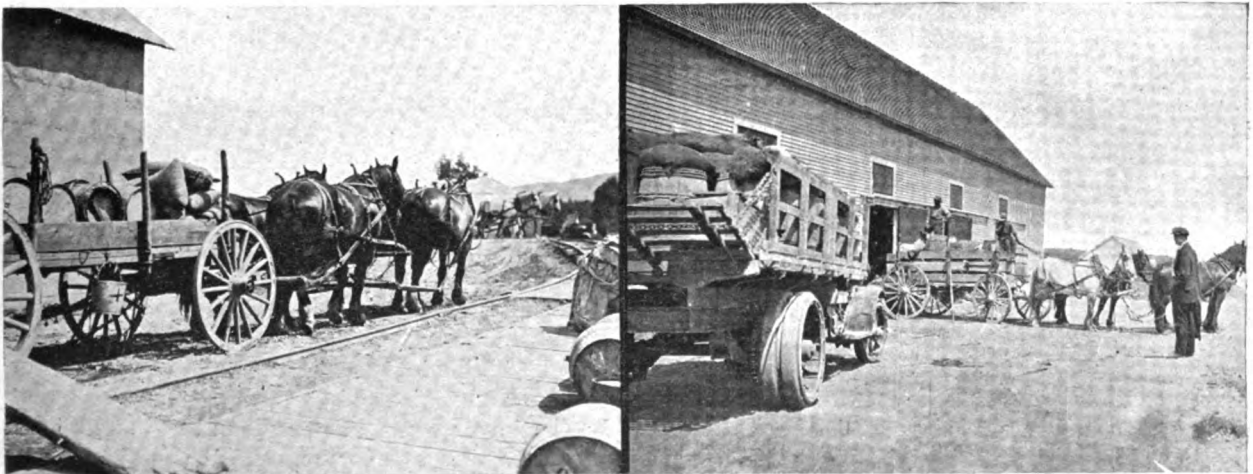
Owing to the long working days the depreciation charge is practically doubled as compared to ordinary truck operation in figuring the truck costs. On that basis the total operating cost for each of the trucks is \$25 per day, or \$175 a week. For the nine trucks this is a cost of \$1575 a week.

As compared with \$4025 a week for horses, this represents a saving of 60 per cent. In the six months' work every year on the dam the saving would amount to \$60,000. And in four years' work, if that is necessary, it would equal an amount that would pay for the road. The cost of maintaining the road would doubtless be greater if it were used by more than 100 four-horse teams than if used by the nine trucks.

If it were necessary to increase the volume of material carried the single shift of drivers now employed could be replaced by two shifts and an additional round trip in 24 hours would be possible.

TOURING PRIVILEGE IN CANADA.

The Canadian parliament in Ottawa has granted to motorists in the United States the privilege of touring for 10 days in Canada without complications as to licenses or customs bonds. Canadian motorists in the United States have had this privilege for some time, but on entering Canada it was necessary to get a license and put up a bond for the re-exportation of the car, which usually cost about \$5. The present privileges are granted at the discretion of the customs officials and are contingent upon satisfying him that it is the intention to take the car out of the country again.



Units of Transportation Equipment: At Left, a Four-Horse Team and Wagon; at Right, a Five-Ton White Truck and Load and a Horse Outfit and Freight.

SPEED AND DANGER UNRELATED.

BENJAMIN BRISCOE declares there is very little relation between speed of a motor car and the likelihood of accident and that attempts to prevent accidents by arbitrary speed limits are necessarily ineffective. As a matter of fact, he says, most accidents occur at low speed and there is far less danger in driving 50 miles an hour on an open road than there is in driving eight miles an hour in a congested city street.

The judgment and capacity of the driver should be the basis of legal control rather than the speed. A poor car in the hands of an inexperienced driver is much more dangerous at low speeds than a good car in the hands of an expert driver at higher speeds.

High speed on an unfrequented road is dan-

Harvey Firestone, president of the Firestone Tire and Rubber Company. The others are W. G. Bee of the Edison company and F. D. Fagan of the General Electric Company.

PENNSYLVANIA S. A. E. SECTION.

At a recent meeting in Philadelphia 50 men decided to form a Pennsylvania section of the Society of Automobile Engineers and will apply to the national body for a charter. About half of those present were members of the S. A. E. or the Electric Vehicle Association.

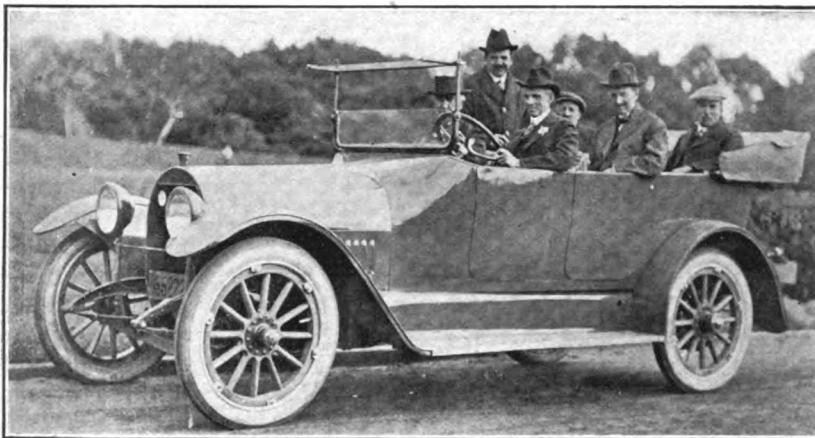
Previous attempts have failed because there were not enough automobile engineers in the territory to organize. The system of accepting af-

franchise members who may take part in the discussions, but not vote, has removed that difficulty. The number of corporations, like steel mills and locomotive works who are now making trucks and tractors, will increase considerably the number of automobile engineers in Pennsylvania.

It was decided in view of large probable purchases by the government of motor vehicles that army and navy officers be invited to take part in the deliberations of the organization, and that members of the student body at the University of

Pennsylvania who plan to make the automobile business their career, also might be interested.

The temporary officers chosen were E. S. Foljambe, chairman; B. B. Bachman, secretary, and Tinius Y. Olsen, treasurer.



Henry Ford and Thomas A. Edison, and Other Distinguished Men, Caught by the Camera While Riding in a KisselKar Six.

gerous to no one but the occupants of the car. It is less easy to be injured by stepping in front of a car going 60 miles an hour than if it is going slower, because the driver has a greater distance in which to turn out.

FORD DRIVES A KISSELKAR.

Photographic evidence that Henry Ford of Detroit is not averse to driving cars that are not made in his factories is offered in the accompanying illustration. This view was taken while Mr. Ford and Thomas A. Edison were on a tour that included a visit to the Panama-Pacific Exposition. Mr. Ford is at the wheel of a KisselKar six, Mr. Edison sits at his right and W. L. Hughson, president of the Pacific Coast KisselKar branch, is standing. Directly behind Mr. Ford is

The proposal of the Massachusetts Highway Commission to ask the legislature to increase the registration taxes at the next session is being combatted by the Automobile Legal Association, with an attempt to have all registration taxes declared unconstitutional. For this purpose, William L. Thibodeau, counsel for the association, drove an unregistered car until he was arrested. In the lower court he was found guilty and appealed to the superior court. The finding of the lower court is expected to be upheld there and then the real fight will come in the supreme court.

LINCOLN HIGHWAY PROGRESSES.

**Second Year Shows Steady Growth of Movement Along All Sections of the Route
—Financial Condition Is Strong.**

IT HAD been expected that after the remarkable enthusiasm aroused by the Lincoln Highway campaign in its first year, the second

CONTRIBUTORS TO 1915 INCOME ACCOUNT.

Henry B. Joy, Detroit.....	\$2000
R. D. Chapin, Detroit.....	2000
C. G. Fisher, Indianapolis.....	2000
A. Y. Gowen, Cleveland.....	2000
F. A. Selberling, Akron.....	2000
John N. Willys, Toledo.....	2000
James A. Allison, Indianapolis.....	1000
Arthur Newby, Indianapolis.....	1000
T. Coleman du Pont, Wilmington, Del.....	1000
H. E. Bodman, Detroit.....	1000
Emory W. Clark, Detroit, contribution of rent for shipping headquarters.....	350

would see a marked slump in interest. Contrariwise, the report for 1915, made by Austin F. Bement, secretary of the Lincoln Highway Association, shows that an even greater development and more real progress has been accomplished than during the first period.

During the first year over half the entire length of the highway was marked, and much was done toward its beautification. Public favor was strong and the President of the United States and the governors of practically all the states through which it runs commended the project.

As during the first year, effort has been concentrated on the marking of the route, its improvement with hard surfaced material, and the campaign to win public approval for the plan of spending public money on it. The results of this latter movement have been very widespread and have brought into existence scores of associations directed toward improving similar roads, either paralleling or connecting with the highway.

The Lincoln Highway Association is not an organization for actually building the road. It never has and never will undertake construction, but it devotes itself instead to propaganda. In some instances it furnishes quantities of cement to get the work started, but these are only for seedling and demonstration miles.

The effect of the propaganda is shown by the fact that the highway is now completely marked from New York to San Francisco. There are points where the marking is not as complete as it should be, but these are being rapidly taken care of. Automobile clubs, local good roads associations, boards of commerce and other civic and patriotic organizations have undertaken to complete the marking in their individual localities.

Cities Mark Their Streets.

In the larger cities, such as Pittsburg and Philadelphia, the municipal governments have taken action to erect handsome markers, bearing a medallion of Lincoln, along the streets by which the route crosses the cities. In Stockton, Sacramento and many other cities, every telegraph pole along the route has been marked.

In New Jersey, from Jersey City to Trenton, the entire length is perfect road and is either concrete or macadam. There has been a great amount of construction in Pennsylvania, where the mountain roads have been practically reconstructed. Special effort has been directed toward abolishing toll roads and grade crossings in this state, and the commonwealth has appropriated \$225,000 for the purpose. In the past 18 months \$150,000 has been spent on the highway.

Records of the association show that \$350,000 have been spent on the highway in Ohio during the past year and that \$610,000 additional has been bonded for by the different counties through which the road passes. Ohio has 66 miles of brick construction on its section of the road, more

REVIEW OF FINANCIAL SUMMARY FOR 1915.

General income account, including funds contributed and sums received from sales of certificates, maps, pennants, guides, advertising, buttons and other material.....	\$28,730.21
Disbursement account, including salaries, rent, postage, office supplies and equipment, printing, travelling expenses, telegraph, telephone, etc.....	26,019.55
Cash balance in bank, Sept. 1, 1915.....	2,684.00
Cash on hand.....	26.57
Bills payable.....	2,398.45
Bills receivable.....	5,627.98
Average monthly operating expense for second year.....	2,129.64

than any other state.

There is no state highway department in Indiana, but the various counties have supported

the work liberally. Under construction or already bonded for are 68 miles of concrete road. In Illinois a concrete section has been completed

CONTRIBUTORS OF CEMENT DURING 1915.

	Pledged	Shipped
	Bbls.	Bbls.
Atlas Portland Cement Co., New York...	6000	2000
Marquette Cement Mfg. Co., Chicago...	5000	1900
Chicago Portland Cement Co., Chicago...	5000	2000
St. Louis Portland Cement Co., St. Louis...	5000	2000
Northwestern States Portland Cement Co., Mason City, Ia.	5000	....
Sandusky Portland Cement Co., Sandusky, O.	5000	....
Crescent Portland Cement Co., Wampum, Penn.	2000	....

between Morrison and Sterling in Whiteside county, with cement contributed by the association.

Across Iowa the entire route has been prepared for hard surfacing to a uniform width of 30 feet. Eleven thousand barrels of cement have been allotted to this state this year for concrete construction and will be placed as soon as necessary action has been taken. The 11 Iowa counties through which the highway runs have allotted \$250,000 during the past two years.

Progress in Nebraska.

In Nebraska there are five sections of concrete construction, including a seedling mile near Grand Island. A great amount of work in leveling, widening and straightening the route has been done in this state, but for the most part the roads are still of natural dirt surface.

In Wyoming all the route is dirt, but it has received much attention, fully \$200,000 having been spent during the past year in maintenance. Sweetwater county, with 152 miles of Lincoln Highway between its borders and a population of 12,000, has expended \$100,000 on the route in the past 12 months. In proportion to the population this is a greater effort than that made by many eastern districts where more money is raised and spent.

In Utah and Nevada, states of great areas, with sparse populations, much work has been done by the ranchers who live along the route. Counties have given as much aid as was possible for them and during the past year more than \$75,000 was appropriated in the two states. The desert roads for 75 per cent. of their entire length are kept in excellent driving condition.

In California, from Lake Tahoe to San Fran-

cisco, the road is practically a continuous boulevard.

The work that has been done on the road has caused a tremendous increase in touring, ranging from 25 per cent. in eastern states to 500 or 600 per cent. at western points. The California State Automobile Association estimates that 25,000 cars have entered that state this year, the majority coming over the Lincoln highway. Two years ago less than one-tenth of this number drove into California. At Ely, Nev., 434 cars passed through in both directions in 1914. In 1915, up to Sept. 1, 1052 cars passed through the town. The expenditure of all the tourists in small western cities is a very important item.

One result of this travel is a great improvement in the character of the accommodations along the way. They are not yet by any means up to the large city standard, but they are greatly superior to those of a few years ago.

NEW TWO-CYCLE MOTOR DEVELOPED.

A new two-cycle motor, which is declared by experts to eliminate most of the objectionable characteristics that have previously been experienced with two-cycle motors, has been developed in Philadelphia and is now being used in trucks and tractors intended for war use.

Instead of using the crank case as a pre-compression chamber, the lower end of the cylinder is used. The connecting rod is outside the cylinder and connects with the piston through a slot in the cylinder wall.

This invariably efficient pre-compression is said to make the operation of the motor at any speed and regardless of the age of the machine as efficient as the four-cycle motor, while all the sim-

REVIEW OF FINANCIAL SUMMARY FOR 1914.

Expenses preliminary to the undertaking in investigation, organization, announcement and establishment of the route, contributed pro rata by Carl G. Fisher, Indianapolis; Albert Y. Gowen, Cleveland; Roy D. Chapin, Detroit; Henry B. Joy, Detroit; Frank A. Selberling, Akron, and John N. Willys, Toledo.....	\$21,701.34
General income account for first year, including funds contributed and sums realized by sale of Lincoln Highway maps, buttons, pennants and other material.....	48,402.76
Disbursement account for first year, including salaries, rent, postage, office supplies and equipment, printing, travelling expenses, telephone, telegraph, etc.....	48,373.10
Cash balance in bank, Sept. 15, 1914.....	20.66
Bills payable.....	3,383.64
Bills receivable.....	2,958.52
Funds on deposit in banks along the route (contributions).....	10,334.00
Average monthly operating expense for first year.....	3,120.64

plicity of the two-cycle is maintained. This improvement is believed to make the two-cycle motor available for automobile use.

GENERAL NEWS OF THE INDUSTRY.

Phenomenal Progress of the Industry—Willys-Overland Issues \$15,000,000 of Stock —Peerless Merges with General Vehicle—New \$6,000,000 Saxon Company.

THE Willys-Overland Company has announced an issue of \$15,000,000 new convertible seven per cent. preferred stock, to be offered to holders of common stock at 102½, each holder of record Dec. 21 being entitled to subscribe to the new stock to the extent of 71½ per cent. of their respective holdings. Out of the proceeds from the sale of the stock the present issue of \$4,483,700 preferred stock will be retired at 110, and the balance will be applied to the general funds of the company.

On or about Jan. 13, 1916, the present preferred stock is to be called for redemption, and accrued dividends and a new preferred stock issue amounting to \$25,000,000 will be authorized. The authorized common stock will be increased from \$25,000,000 to \$50,000,000. A special meeting will be held next January to ratify these changes.

It is expected that the company will have earned at the end of the calendar year approximately \$12,000,000, available for dividends. It has been officially announced that profits for nine months ending Sept. 30, were \$8,500,000, after a liberal charge off. Of this amount about \$3,500,000 were earned during the last three months, while last month's profits were approximately \$1,500,000.

President John N. Willys has said that sales for the calendar year will be about 80,000 cars and that the new additions to the plant, which are well under way, will give the concern capacity for about 1000 cars a day, beginning in April, 1916.

"Up to this time," said Mr. Willys, "the enlargement of the facilities of the company has been accomplished by the use of surplus earnings. Although the company's requirements for the present and the near future are amply provided for, the management of the company has deemed it a policy of conservatism, in view of the very rapid increase of the business, to provide additional cash capital for the sale of stock."

PEERLESS FINANCES REVEALED.

The Peerless Truck and Motor Corporation, by which the Peerless Motor Car Company,

Cleveland, O., and the General Vehicle Company, Long Island City, N. Y., are owned through a recent merger, has issued a statement of its assets and liabilities and those of its subsidiaries as of Sept. 30, 1915.

The subsidiary companies report cash in banks and on hand of \$2,376,082, and the parent company, \$292,500, making a total of \$2,668,582, equal approximately to \$13.40 a share. Current assets amount to \$4,389,897, and current liabilities, \$810,961, leaving a working capital of \$3,578,936, equal to nearly \$18 a share.

The consolidated balance sheet as of Sept. 30 is given as follows:

ASSETS.	
Patents, franchises and good will (\$5,000,000, represented by common stock of General Vehicle Co.)	\$5,100,000
Land, buildings, equipments, etc.	4,664,268
Investments	19,036
Inventories, materials and supplies	1,308,832
Accounts and notes receivable	685,946
Cash in banks and on hand	2,376,082
Prepaid expenses and insurance	46,695
Development, engineering, expenses, etc.	161,866
Total	\$14,362,727
LIABILITIES.	
Peerless Motor Car 7 per cent. cum. pfd. stock	\$2,100,700
Peerless Motor Car common stock	2,085,500
General Vehicle Company, Inc., 7 per cent. cum. pfd.	1,200,000
General Vehicle Company, Inc., common stock*	5,000,000
Funded debt—cash for the retirement of which has been provided by company:	
First mortgage gold bonds Peerless Motor Company	900,000
Less—retired or to be retired by Peerless Motor Car Company†	300,000
	\$600,000
Mortgage payable in real estate in New York City	300,000
Special deposits	126,275
Accounts payable	557,309
Sundry creditors	127,378
Reserves	197,532
Surplus to be created by cancellation of notes payable of General Vehicle Company, Inc., as of Oct. 31, 1915	900,000
Undivided surplus	1,168,033
Total	\$14,362,727

*Represents patents, franchises, good will, as per contract. †Money has been deposited with the trustee for the purchase of remaining bonds.

That no change in the organization, policies or plans of the Peerless Motor Car Company are to be made in the merger is the substance of a notice sent by President L. H. Kittredge to Peerless dealers. The announcement follows:

In order that the relations of the Peerless Motor Car Company to the newly organized Peerless Truck and Motor Corporation may be clearly understood, the following announcement is made:

The majority of the stock of the Peerless Motor Car Company has been acquired by the Peerless Truck and Motor Corporation, which has also acquired control of the General Vehicle Company and may acquire other concerns engaged in the motor vehicle industry.

The controlling interests in the Peerless Truck and Motor Corporation are most friendly to the former owners of the majority of the stock of the Peerless Motor Car Company, who will have a large interest in the Peerless Truck and Motor Corporation and who will be represented on its board of directors by L. H. Kittredge, B. G. Tremaine and F. S. Terry.

The Peerless Motor Car Company will continue exactly as it has been in the past and will maintain its separate corporate existence. It will proceed with the manufacture of its eight-cylinder passenger car, which will soon be announced. It will also continue to manufacture its regular line of trucks and a new two-ton model, which will be announced later. Its executive force, sales and factory organizations will be continued without change.

The plans of the Peerless Truck and Motor Corporation involve the development of the business of the Peerless Motor Car Company along the broadest and most comprehensive lines and will, we believe, result in increased opportunities and a more extensive line of product for its dealers.

GENERAL MOTORS DIRECTORS.

As predicted, the following slate of directors for the General Motors Company was elected at the recent meeting of the stockholders:

E. W. Clark, J. H. McClement, Thomas Neal, C. S. Mott, Charles W. Nash, J. J. Storrow, Albert Strauss, W. C. Durant, Lamot Belin, L. G. Kaufman, Pierre du Pont, S. F. Prior, A. H. Wiggin, C. S. Sabin, J. A. Haskell, A. F. Bishop, J. J. Roskob, Joseph Boyer, R. F. Herrick, Edwin D. Metcalf, M. J. Murphy, N. L. Tilney and Jacob Wertheim were the members of the old board who were not re-elected.

C. W. Nash, president, said regarding the affairs of the company: "All the companies in the General Motors Company are now for the first time since I have been associated with the company, on a paying basis. The production of cars from the beginning of the fiscal year, Aug. 1, up to Nov. 11, was 12,500 cars ahead of the same period a year ago. Sales in this period were 13,500 cars ahead of last year. The company has a large cash balance, notwithstanding that in recent weeks the total of \$11,000,000 has been paid in dividends and retirement of notes."

NEW \$6,000,000 SAXON COMPANY.

Announcement was recently made that a new \$6,000,000 company will be formed soon to take over the Saxon Motor Company, Detroit. The capital will be in common stock, and there will be no bonds and no preferred stock.

It is understood that the stock will be offered

for public subscription at \$75 per share, subject to allotment, and that a first payment of \$5 per share for each share applied for must accompany all subscriptions.

The company ranks as the 10th largest manufacturer of automobiles in the world. Net earnings for the current year are given as \$850,000 on a production 17,000 cars. It is believed that the company is covered both as to orders and parts for production of at least 30,000 cars in 1916, on which output profits are estimated in excess of \$1,500,000.

The control and management of the new company will remain as heretofore. Harry W. Ford will be president, Lee Counselman, vice president, and Lincoln Scafe, treasurer.

HUPP TO ISSUE NEW STOCK.

The Hupp Motor Car Company, Detroit, has completed arrangements for the issue of \$1,500,000 worth of new preferred stock. According to J. Walter Drake, president of the company, the refinancing was consummated to take care of the increase in business during the past few months and to provide adequate facilities for meeting the demand for Hupmobiles in the future. "With less than five months of our present season past, it has become evident that our estimated production of 15,000 cars is insufficient," said Mr. Drake. "We have just acquired large tracts of land adjoining the present Hupmobile factory, and have already begun the erection of a number of new buildings. Negotiations are now pending for the acquisition by the Hupmobile company of one of the largest and most efficient parts producing plants in the industry."

MILLER RUBBER ELECTS.

All officers and directors of the Miller Rubber Company, Akron, O., were re-elected to office at the annual stockholders meeting recently held in Akron. The personnel includes Jacob Pfeiffer, president; C. T. Grant, vice president; F. B. Theiss, treasurer and assistant secretary; W. F. Pfeiffer, secretary and assistant treasurer, and J. M. Doran.

The president's report showed an increase in surplus to \$813,000, and common dividends were advanced from 10 to 12 per cent. Sales for the year were 30 per cent. greater than the year previous, and factory floor space was increased during the year by about 6½ acres.

WILLYS FORMS CANADIAN COMPANY.

The Willys-Overland, Ltd., has been organized in Canada with a capital of \$6,000,000. The head offices will be in Toronto and the business will be under the immediate direction of T. A. Russell, who has been vice president of the Russell Motor Car Company of Canada, and who is vice president also of the new company. John N. Willys is president.

While the company is a purely Canadian corporation and its business will be conducted separately from the American company, five directors of the American concern will serve on the board in order to give it the advantage of engineering production and sales experience gained in American plants.

These five directors will be John N. Willys, H. T. Dunn, Walter Stewart, Harry Shepler and C. A. Earl. The Canadian directors are T. A. Russell and Lloyd Harris of Toronto. The new company will take over the complete automobile business of the Russell Motor Car Company and the Overland Canadian business.

The actual manufacture of the cars complete will be undertaken in Canada, and for that purpose the Russell company's plant will be enlarged at once and be equipped for quantity production.

CHASE ELECTS DIRECTORS.

Following the recent announcement at a meeting of the Chase Motor Truck Company, Syracuse, N. Y., of an increase of 218 per cent. in its business, comes the announcement of the selection of the following to serve as directors for the ensuing year:

A. M. Chase, president and general manager; Col. A. C. Chase, capitalist of Syracuse; L. O. Bucklin, president of Little Falls National Bank, Little Falls, N. Y.; E. C. Witherby, general manager of Semet-Solvay Company, Syracuse; H. P. Bellinger, general manager of the caustic department of the Solvay Process Company, Solvay, N. Y.

The officers of the company for the next year are expected to be named at a meeting to be held the first of December.

CAPITAL INCREASED TO \$2,500,000.

The capital stock of the Perfection Spring Company, Cleveland, O., has been increased from \$1,500,000 to \$2,500,000, and it will be distributed as follows: \$1,500,000 common stock, of which

\$1,000,000 will be issued immediately; \$1,000,000 preferred stock, of which \$750,000 will be issued at once.

The conduct of the business and the officers remain precisely as before. The directorate has been increased by the addition of F. F. Prentiss, Chester C. Bolton and T. E. Borton. No stock will be sold to investors at this time.

PLANNING TIRE FACTORY.

Five men of Wichita, Kan., are reported to be organizing an automobile tire factory in that city, with a capital of \$600,000. The organizers are Charles Darrigrand, Ransom Stephens, C. A. Matson, W. T. Watson and M. V. Price. The last named invented the tire which the company expects to manufacture.

Mr. Watson was formerly a banker at Moline and Mr. Darrigrand resigned from the superintendency of the Dold packing plant to enter the tire business.

SECOND 100 PER CENT. PLUM.

According to financial rumors, stockholders of the Paige Detroit Motor Car Company may soon receive a 100 per cent. stock dividend, which would make the second declaration of that size within a short period. The stock is now paying five per cent. a month in cash dividends. Prior to the last stock dividend of 100 per cent., which increased the capital from \$250,000 to \$500,000, it was paying 10 per cent. cash a month.

MAXWELL STOCKHOLDERS APPROVE.

The stockholders of the Maxwell Motor Company recently ratified the plan whereby the stockholders of record Nov. 15 have the right to subscribe to an issue of \$1,050,000 of new first preferred stock to the extent of five per cent. of their holdings. This is preliminary to the payment of back dividends due.

TO SELL BROWN PROPERTY.

The referee in bankruptcy, Harry C. Sheridan, in the case of the Brown Commercial Car Company, notified creditors of the bankrupt of a meeting to pass upon the plan to sell the real and personal property of the estate. The meeting was called for Nov. 27 at Frankfort, Ind.

CONNECTICUT TELEPHONE CHANGES.

P. P. Hinckley of Chicago has joined the sales force of the Connecticut Telephone and Electric Company, Meriden, Conn., and will handle the jobbing trade east of Chicago.

The company's jobbing connections in Chicago and the West will be managed by J. W. Fulton, with offices at 1100 Karpen building, Chicago.

DEATH OF F. SHIRLEY BOYD.

F. Shirley Boyd, who was widely known as a successful sales agent for manufacturers of motor vehicle parts and accessories, died Nov. 15 at



F. Shirley Boyd, Widely Known Dealer in Automobile Parts and Supplies, Who Died Recently in Boston.

Boston from complications that followed an operation for appendicitis. He was believed to be recovering when there was a change that resulted in his death. He was 43 years of age and is survived by a widow.

Mr. Boyd was born and educated at Cambridge, Mass., and early in life engaged in business as a dealer in bicycles. He translated this to marketing automobile components and accessories, and became New England distributor for several well known concerns, developing a very lucrative patronage. He was located in very attractive salesrooms at 175 Massachusetts avenue when he became ill.

Mr. Boyd was possessed of a strong and pleasing personality that attracted to him an unusually wide circle of friends, and his business relations with an extremely large number of patrons were harmonious and satisfactory. He was prominent in the activities of the Bay State Automobile Association and was one of its most progressive members. A committee of that organization represented it at the funeral ceremonies.

ROBERT ELLIS GOES TO BOSTON.

Robert M. Ellis, formerly export manager of the Splitdorf Electrical Company in New York City, has been transferred to the Boston Splitdorf company as manager, and has been made treasurer and a director of the company. He succeeds Harry R. Curtiss, who goes to Chicago with the Excelsior General Supplies Company as manager and treasurer.

Mr. Ellis is well and favorably known in New England, having travelled through that section for the Bi-Motor Equipment Company of Boston, of which he was manager at the time, two years ago, when the Splitdorf officials were attracted by his executive and selling abilities and engaged him for their New York City company.

DE LISSER OUT OF BRISCOE.

Horace De Lisser, who held the title of general manager of the Briscoe Motor Company, Jackson, Mich., has been succeeded by Frank Briscoe, brother of President Benjamin Briscoe. Mr. De Lisser had headquarters in New York City and was able to direct affairs of the company only in a general way, leaving the details to the officials at Jackson. The change will remove a large burden from President Briscoe.

HYATT INCREASES CAPITAL.

The Hyatt Roller Bearing Company, Newark, N. J., is preparing to increase its capital stock from \$400,000 to \$6,000,000, which move is made necessary by the phenomenal increase of its business, involving large expenditures for machinery and buildings. There is now under construction two eight-story and one six-story building as additions to the plant, and more are expected in the early future.

MYERS REJOINS STUTZ.

William D. Myers, who resigned from the sales managership of the Stutz Motor Car Company in 1914, has returned to that position, succeeding Harry W. Anderson.

Charles B. Perry, Santa Ana, Cal., with two relief drivers, drove his Maxwell car on a wager 5975.1 miles without stopping the motor and at an average of 24.25 miles to the gallon of gasoline. The car made the run without adding air to the amount in the tires when it was begun.

MOTOR STARTING AND CAR LIGHTING.

Bosch Standard Lighting System, Designed to Afford the Owner a Choice of Some Components to Meet Individual Taste and Obtain High Efficiency.

FOLLOWING a policy of specializing production to meet the requirements of a very wide range of motor vehicle owners, the Bosch Magneto Company has perfected four systems for engine starting or automatic lighting, which may be used independently or in combination. By this is meant that either an engine starting or a lighting system may be installed as desired, and that the two may be combined to form what is generally referred to as a two-unit system.

There are two Bosch lighting systems—the Bosch Standard Lighting System and the Bosch De Luxe Lighting System, and there are two engine starting equipments, which are known as the Bosch Flywheel Starting System (System Rushmore), and the Bosch Overrunning Clutch System. Each of these is distinct in itself, and either of the starting installations may be used in combination with either of the lighting systems.

The Bosch Magneto Company maintains that it is the largest manufacturer of gas engine electric ignition apparatus in the world. It has a very large factory at Springfield, Mass., where magnetos are built, but the starting equipment is produced at the Rushmore works at Plainfield, N. J. The Bosch company, through the efficiency of its products and the general satisfaction obtaining from their uses by motorists and yachtsmen, is known in every civilized country.

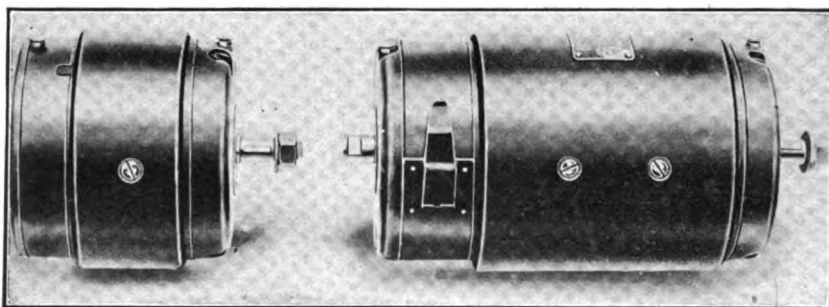
While the original productions of the company were ignition apparatus only, the policy of producing whatever was necessary or desirable as electrical equipment was established, so that car owners can have their machines equipped with the products of a single maker, instead of several, and be assured of service thoroughly reliable and dependable.

Advantage of Uniform Equipment.

There are few concerns manufacturing electrical automobile equipment that produce everything required for complete electric systems.

There is undoubted advantage when all components are of one make, especially in the event that repair or restoration are necessary. Uniform equipment of cars undoubtedly appeals to owners because of the simplification of installations, for even with all else equal a majority, at least, prefers to deal with one concern rather than with several, often times widely separated. Not only this, the best known manufacturers maintain service stations in commercial centres and are represented very generally, which is a convenience and an assurance to owners who tour.

The Bosch company has a remarkably complete distributing organization. To serve those who use its products, and to facilitate renewals and replacements, branches and agencies have been established throughout the world.



The Two Types of Dynamos, the Smaller Known as a Fan Type, Is Designated DSR 103, and the Larger DSR 3.

While the company has never advocated the combination of ignition equipment with starting and lighting systems, because of the belief that greater dependability and the highest efficiency could be obtained from independent apparatus, it has sought in the systems it produces, to insure the largest measure of reliability, endurance and economy.

Owner Has Choice of Components.

The lighting system originally produced by the Bosch company is continued without change. This is known as the De Luxe, and is supplied only in its entirety, it including besides the generator or dynamo all accessories, such as the cable, all lamps, attachment box, voltmeter-ammeter, switches, etc. It is intended to meet the re-

quirements of those who desire all components for such a system made by one manufacturer, and which will have every quality that will

ence seek first of all to obtain dependability, for they realize how essential and necessary is reliable equipment.

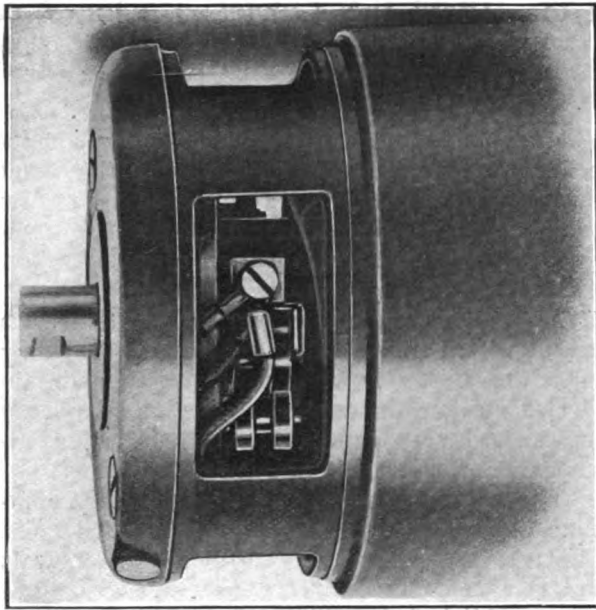
Two Types of Dynamo.

The Bosch Standard Lighting System is supplied with either of two dynamos, these machines differing principally in sizes. The larger of the two is designated as type DSR3, and the smaller is known as DSR103, the former being rated at 100 watts capacity and the latter at 80 watts. They differ in size and capacity, but both are designed to be operated with a six-cell storage battery, which is very generally known as 12 volts.

As might be assumed, each machine has uses for which it is especially adapted, and for which it has qualities that recommend it in preference to the other. For illustration, type DSR3, the larger, is intended for operation either at engine speed or one and a half times engine speed, and as generally built it has through drive. With this construction the machine may be driven by the pump shaft of four or six-cylinder engines, and, should occasion demand, it may be installed with and used to drive a magneto or pump or other device connected tandem. This is not an unusual installation. In fact, it is very frequently used and is regarded as the best of engineering practise.

One Type for End Drive Only.

The other dynamo, type DSR103, is built with end drive only, being intended for driving at either two and a half or three times engine speed. This design is sometimes known as the fan-type of generator, for it is possible to mount it directly ahead of the first cylinder or the cylinder block, so that a common drive may be used

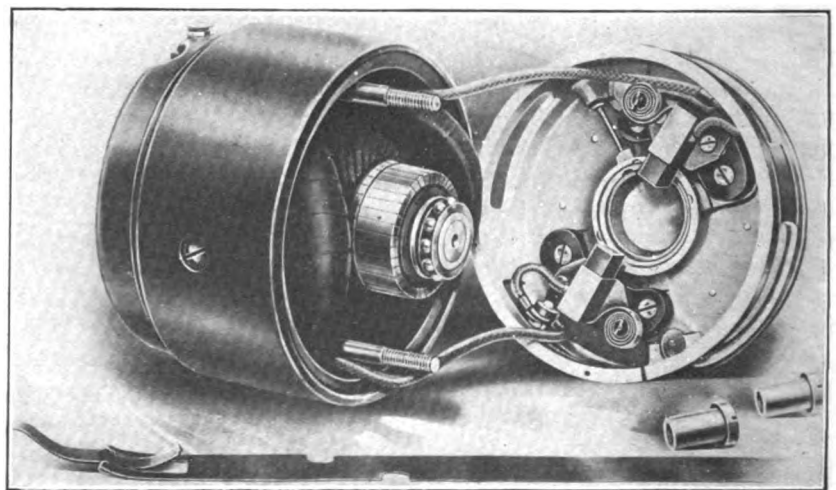


The Commutator End of a Bosch Dynamo with the Commutator and Brushes Exposed for Examination.

recommend an equipment to an owner.

This has been supplemented by the Bosch Standard Lighting System, which affords to owners who desire a choice the widest range of selection of components aside from the means of generating and distributing the current. It can be obtained without lamps, cable or other accessories, so that the needs of the owner with reference to designs and sizes of lamps and the like can be met by purchasing those that more nearly satisfy his particular ideas.

This does not mean that quality has been sacrificed, although the purpose is to meet a general demand. To the contrary, while the system has been produced at parity with the prices of others to be obtained in the market, it is absolutely dependable and reliable and equal to any requirement that may be made upon it. In fact, statement is made by the Bosch company that the system was designed and constructed to obtain satisfactory service before price was considered. In this connection statement may be made that motorists who have experi-



The Commutator End Cap of Type DSR 103 Dynamo Removed, Showing the Simplicity of Construction and the Accessibility of the Machine.

for both the dynamo and the fan that promotes radiation, or it may be installed at the side of the first cylinder or the engine block and used with a



The Type CB 101 Control Box, by Which the Entire System Is Controlled, Which Is Mounted on the Engine Side of the Dash.

three-point drive, from the crankshaft to the dynamo pulley or pinion and to fan pulley or pinion. The drive may be either by gear, coupling, chain or belting, the form of power transmission depending upon the desires of

the designer. Or there may be a combination of gears or silent chain from the crankshaft to the dynamo shaft, and then by belt from the dynamo shaft to the fan shaft. The machine is in this manner perfectly adaptable to widely varying engine design and for this reason can be taken as meeting with a general demand.

In these particular respects the dynamos differ, but in others they are more nearly alike. Much care has been taken in the construction of the frame or case to obtain what will afford effectual protection against dust and water, and which will insure rigidity and endurance with minimum weight. The housings are formed of seamless steel tube that is cut to the desired length, and the end plates are substantial metal caps that are secured by two bolts extending the length of the housing and inside it, so that the frame is perfectly clear outside. The end plates or caps are heavily constructed to carry the bearings of the armature shafts, and when these are drawn on by nuts and bolts the housing is practically sealed and secured against entrance of foreign matter.

The dynamos are built with two pole or field pieces, which are encircled by the field windings, and these are bolted rigidly to the inside of the housing. The dynamos are a shunt wound type, with the field and the shunt windings included in single forms, and the design of the windings is such that they practically encircle the armature. The purpose of this design is to counteract armature reaction, so

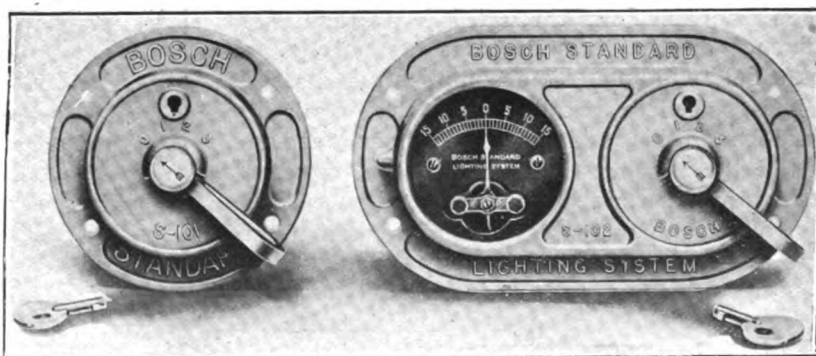
that practically sparkless commutation is obtained. This is to obviate sparking and the consequent burning of brushes and the commutator, which considerably increases the life and endurance of both commutator and brushes and minimizes the attention necessary for the effectual maintenance of the machine.

The armature is the laminated type. This is constructed of a series of soft iron discs assembled on a sleeve and after being contacted by heavy pressure these are secured by substantial plates. The armature windings are very thoroughly insulated, to insure positive efficiency and protection. The armature is a slotted drum type, designed to obtain practically noiseless operation. The commutator is very carefully made. The armature shaft is mounted on large ball bearings that are rigidly carried in the end plates, and the clearance between the armature and the poles is minimum, so that high electrical efficiency in ratio to the armature size is obtained.

Brushes and External Connections.

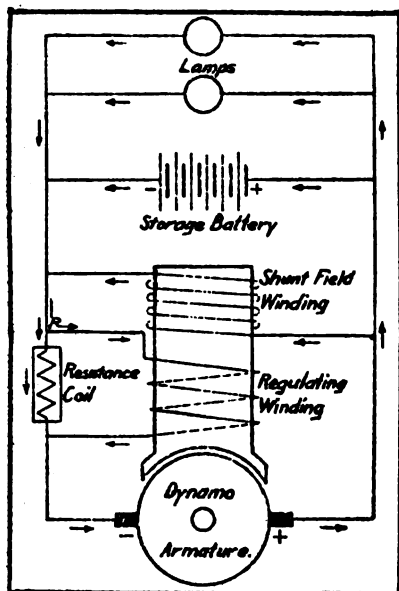
The brushes are a special carbon composition that is designed to afford maximum life, and these are mounted in holders that are insulated from and secured to the commutator end cap. The brushes are large in size and are extremely enduring. They are held against the surface of the commutator by flat coiled springs. Each brush is fitted with a pig tail or short current carrying cable to obviate current carrying losses at the brush holder springs.

The four external connections are fitted in the shaft end cap of the dynamo, being well insulated, and they are so arranged that they are very accessible. The screw terminals with which the connections are provided afford a positive path for the current to pass from the dynamo to the external circuit. The terminals are numbered from one to four, to facilitate the wiring of the dynamo.



The Two Types of Switches, the Smaller, Type S 101, Is Without Ammeter, and Type S 102 Is with Ammeter—Both Switches May Be Locked.

There is an opening in the housing at the commutator end of the dynamo that is enclosed with a recently perfected garter cover or strap



Circuit Diagram, Showing the Current Flow and the Principle of the System.

that is fitted with a special catch so that it may be quickly and easily detached for the purpose of examining or cleaning the commutator.

The design of this dynamo has been developed with a view to operation at very widely varying speeds, and yet maintaining what may be regarded as a fairly uniform current supply to the battery,

as well as carrying the car electrical load, which means the current consumed in lighting the head, dash, tail and other lamps included in the car's equipment. The general characteristic of all dynamos is that the voltage will vary with the speed of the armature, and there is a greater current output as speed increases. This increase of voltage would be very destructive were it not regulated, and this is usually done by the installation of a regulator or by the arrangement of the windings, although sometimes a third brush is used.

The regulation of the Bosch dynamo is obtained by the design of the field winding, which is so arranged in relation to the shunt field (this being a second winding on the field poles) that when a current flows through it has a regulating influence on the lines of force created by the shunt field winding. To accomplish this a resistance is placed in parallel with the regulating winding, and this resistance is so proportioned and so placed that when the current output increases above a predetermined value the resistance of the controlling unit increases to a point where a current is allowed to flow through the regulating winding, which in turn reduces the magnetic strength of the field poles and diminishes the output of the dynamo. As the strength of the current increases the process described is repeated, so that the current production of the dynamo is

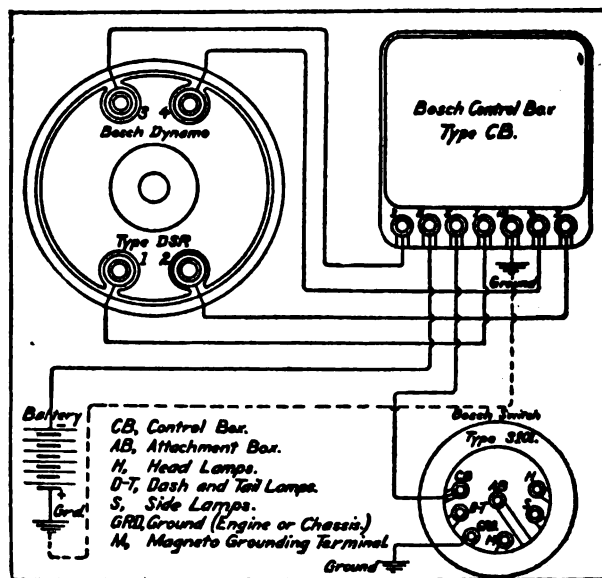
held at practically a constant value without regard to the speed of the armature.

Battery Controls the Current Output.

The method of regulation is such that the current output of the dynamo is kept practically at a point where it will best serve the requirements of the system, the voltage of the system being determined by the battery. When current is drawn from the battery for the lamps, when the lamps are used and the engine is idle, or when the engine is being started, there is a reduction of voltage, and as the regulating resistance is proportioned to the current output, current will be supplied to the battery whenever the dynamo is started. The system is so designed that the entire lamp load can be carried without a drain upon the battery, even when the vehicle is being driven at comparatively slow speeds. Practically speaking, the only draft upon the battery is when the engine starter is used or the vehicle is standing with the lamps lighted. Another very interesting quality of this design is that the several units of the system may be used in connection with either the insulated or the grounded return method of wiring—that is, with either the single or the two-wire systems.

Control Members in Unit Assembly.

The system includes a control box, which is designated as type CB 101, which is designed for mounting on the engine side of the vehicle dash, or in any other place that may be equally convenient for inspection by the driver. Included with the control box are the automatic cut-out, the resistance coil, the main fuse and the field



Wiring Diagram of the Complete System, Every Terminal Being Plainly Marked So That Connections Can Be Easily Made.

fuse. The automatic cut-out is designed to automatically disconnect the dynamo from the battery when the dynamo voltage falls below the voltage of the battery, and it automatically connects the dynamo to the battery when the dynamo voltage is in excess of the voltage of the battery. This is a protection of both the battery and the dynamo and is positive and certain in its function.

The purpose of the resistance coil, for regulating the current output, has already been described. The field fuse is to protect the dynamo when, through accident, one of the cables connecting the battery becomes disconnected, which would cause an abnormal rise in voltage at the dynamo terminals. In such an event the field fuse will melt and the field circuit will be opened, which will terminate the generator of current until the fuse is replaced.

The units of the control are all mounted on a substantial insulated plate and these are protected from damage by a light metal cover. The cover is retained by two crowned nuts, which are easily removable in the event of need. The base of the control box carries the terminals by which connections with the other units of the system (the dynamo, battery and switch) are made. The terminals are so placed as to be readily accessible and each is plainly designated, so that the connections can be made without error.

Two Types of Switches.

With this system two types of switches are used, one of which is designated as S 101 and the other as S 102. Switch S 101 is a plain switch, but S 102 is a switch and ammeter in combination. The ammeter affords a means of visual indication of whether or not the system is functioning normally, and it is constantly before the eyes of the driver. Each switch is provided with a lock similar to that supplied with the Bosch dual and duplex coils. Either switch may be locked and the key removed in any of the four positions, and as the magneto is also controlled by the S 101 or the E 102 switch, the removal of the key in the "Off" position of the switch locks the ignition system as well. The switching combinations are such that all driving conditions can be met. These are as follows: "O"—Off (magneto is also inoperative); "1"—Attachment box on (magneto also operating); "2"—Attachment box, dash, tail and side lamps on (magneto also operating); "3"—Attachment box, dash, tail and head lamps on (magneto also operating). The switch may be located within convenient reach of the driver, and should the combination switch and ammeter be used, this

should be placed where it may be readily seen at all times. For convenience in making connections the terminals are placed at the back of the switch and are lettered as are indicated in the wiring diagram.

With this system the battery used should be a six-cell, or what is generally known as a 12-volt type, and for ordinary requirements should be 50 ampere-hours capacity. The batteries may be furnished by the maker or they may be purchased by the car owner. Because of the possibility that these systems may be installed by those who are not mechanically expert or have a comprehensive knowledge of electricity, all terminals of the different units are numbered and lettered, so that wiring may be done with certainty. These connections are all tabulated in the wiring diagram and can be easily followed. The Bosch company will supply all components for the system when desired.

SEEDLING MILES ON LINCOLN WAY.

For the purpose of demonstrating to the people along the Lincoln Highway the value of hard surfaced roads, made of concrete according to the standard specifications of the association, five seedling miles have been built during the past year with cement furnished by the association.

A considerable number of additional miles will be constructed in the same way next year, and it is proposed to pave a stretch of road somewhere between Salt Lake City, Utah, and Reno, Nev., as a memorial to Arthur R. Pardington. At a recent meeting of the Lincoln Highway Association, A. F. Bement, publicity director, who has been carrying the duties of secretary since Mr. Pardington's death, was made secretary of the association.

CONTEST BOARD SUSPENDS DRIVERS.

The contest board of the American Automobile Association at its meeting in New York City, Nov. 11, reinstated the following drivers, who had been suspended for various reasons: D. K. Sworder, G. C. Bergdoll, H. M. Strachan, A. C. Mattison, B. Ward Beam and C. M. Lanahan. Arthur Klein and William B. Brown were refused reinstatement. Eighteen drivers were suspended until Nov. 1, 1916. Most of them were men who had competed on the dirt tracks in small meets. Barney Oldfield was fined \$250 for appearing in an exhibition at an unlicensed race at Wichita, Kan., Oct. 14.

PROVIDENCE AUTOMOBILE SHOW SUCCESSFUL.

FORTY thousand people attended the Providence automobile show, Nov. 12-20, and dealers report that many sales and a decided stimulus to business resulted from the exhibition.

There was a large number of new models and new types of cars on display. One striking feature was the tendency toward wire wheels, as shown on the display models. The number of eights and twelves had greatly increased since the last year, and while there were several sixes, the proportion had declined since a year ago. Accessory dealers were represented in 17 exhibits.

The changes in types and designs were representative of the development of the industry for

bile show. The Packard Twin-Six was on display and received a great deal of attention. The prevailing demand for convertible winter tops was evidenced by the large number of cars of that type on exhibition.

The Oakland display was new at the Providence show. Examples of the complete line, eight, four and six-cylinder models, were introduced to the Rhode Island public for the first time. The Scripps-Booth roadster attracted a great deal of attention, although the car has been on sale in the Rhode Island territory since its inception, and a great many of them have been sold.

The Cadillac eight came in for its share of attention, although, as the oldest eight, it was well known here. A new car of the multi-cylinder type was the Standard eight, produced by the Standard Steel Car Company of Pittsburgh.

The following are the names of the cars shown and of the Rhode Island exhibitors who displayed them:



Photograph, by Courtesy of Wm. Mills Son, Providence, Showing Cars on Display in the Main Hall at the Providence Automobile Show. In the Foreground is a Mortar Used in Drills by the Rhode Island Coast Artillery.

the last year so far as they have been disclosed by the makers. The small bore motor— $3\frac{1}{2}$ inches or less—which was already in the majority last year, showed an additional gain. Detachable cylinder heads proved more common; the vacuum fuel feed was seen to be gaining rapidly on both pressure and gravity. The disc clutch was again slightly stronger than the cone. Generator-battery ignition gained in strength. Cantilever springs were more numerous and there was a distinct decline in the expensive platform type. There was no appreciable difference in the average wheelbase length.

Among the new cars that attracted special attention was the new Overland four at \$615, which was here shown for the first time at an automob-

Mercer, Adams & Knight; Buick, Aetna Bottle and Stopper Company; Auburn, Auburn Motor Sales Company; Apperson, Baird-North Company; Lewis, Charles Barre; Allen, Charles Barre; Dodge, Broadway Sales Company; Cadillac, Cadillac Auto Company; Standard, Harold C. Crane; Locomobile, Nelson S. Davis; Haynes, Richard G. Davis; Maxwell, Howard G. Duckworth; Pierce-Arrow, Foss-Hughes Company; Chalmers and Winton, Foster-Smith Company; Cole, William H. Fuller; Studebaker, Goodwin-Sherman Motor Car Company; Scripps-Booth, Albert J. Howard; Reo, the William Hughes Company, Inc.; National, Stearns-Knight and White, the Knight Automobile Company; King, Langley Motor Sales Company; Jackson, J. A. McDonald; Metz, Metz Company, Providence branch; Briscoe, Frank Mount; Moon, Edgar L. Nock; Oakland, Oakland Motor Car Company; Jeffery, Marion and Premier, John O'Donnell; Packard, Packard Motor Car Company; Paige, Paige Motor Company of Rhode Island; Chevrolet and Oldsmobile, Peckham Brothers Company; Hudson, Robert W. Powers; Overland, Pugh Brothers Company; Saxon and Stutz, Saxon Motor Company; Bell and Davis, Chauncey M. Stone; Dort, Wentworth Fosdick Company; Westcott, Whitten Motor Vehicle Company; Franklin, Wallace L. Wilcox.

The commercial cars shown were the following: Buick, Aetna Bottle and Stopper Company; Autocar, Autocar Sales and Service Company; G. M. C., Cadillac Auto Company; Pierce-Arrow, Foss-Hughes Company; Studebaker, Goodwin-Sherman Motor Car Company; Reo and International, B. F. & A. W. Hopkins; White, Knight Automobile Company; Knox tractor and trailer, Knox Motor Associates; Metz delivery car, Metz Company, Providence branch; Republic, John O'Donnell; Packard, Packard Motor Car Company; Willys-Overland, Pugh Brothers; Federal, U. S. Mill Supply; Vim, Vim Sales Company.



A YEAR full of unexpected surprises, occasioned by the announcements of the Willys-Overland Company, reaches a climax in the introduction to the public of a new light four-cylinder car which is to sell for \$615 as a touring car and for \$595 as a roadster.

This car is equipped with an electric starting and lighting system, high-tension magneto ignition, speedometer and the usual Overland button control board. A feature is the use of 31 by four-inch tires, an unusual size, and the largest that have ever been applied as standard equipment to a car of this size.

Another interesting departure from previous Overland fours, except Knight engined types, is the use of long cantilever springs in the rear instead of the usual fractional elliptics.

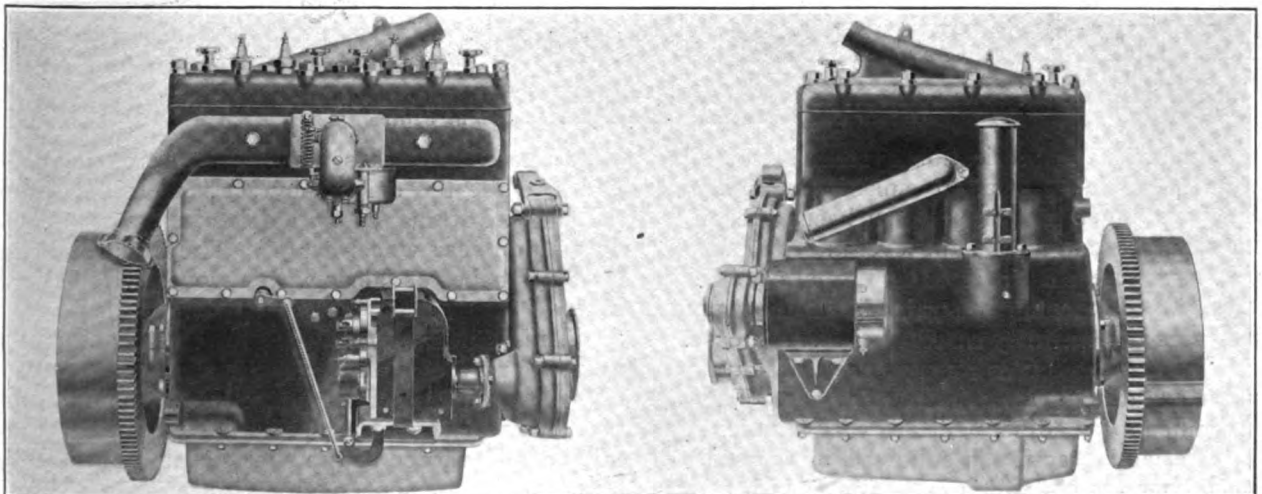
The car is called the model 75. It will not

supplant the \$750 four, model 83, of which an unprecedentedly large number have been sold this season, but the two will be made side by side. This new car is intended for those who desire a smaller, lighter and more economically operated car. Its arrival is particularly opportune in view of the rapidly climbing price of gasoline.

Roomy Five-Passenger Body.

While the wheelbase is several inches shorter than that of the \$750 car—104 inches—it is long enough to allow the use of a body providing comfortable seating capacity for five persons. The car weighs only 2160 pounds.

The motor is an exceedingly neat, compact and simple design. Unlike previous Overland fours, the cylinders are cast en bloc instead of singly. The bore is $3\frac{1}{8}$ inches and the stroke is five inches. The crankshaft is supported on two



The Long-Stroke Block Type Model 75 Overland Motor, in Which Silent Chains Are Used Instead of Gears.

main bearings. The entire power plant is hung in the frame at three points.

Water circulation is by a thermo-syphon system. A large fan runs on ball bearings. The radiator is of the cellular type, through which the water circulates vertically. The radiator shell is pressed from one piece of sheet steel.

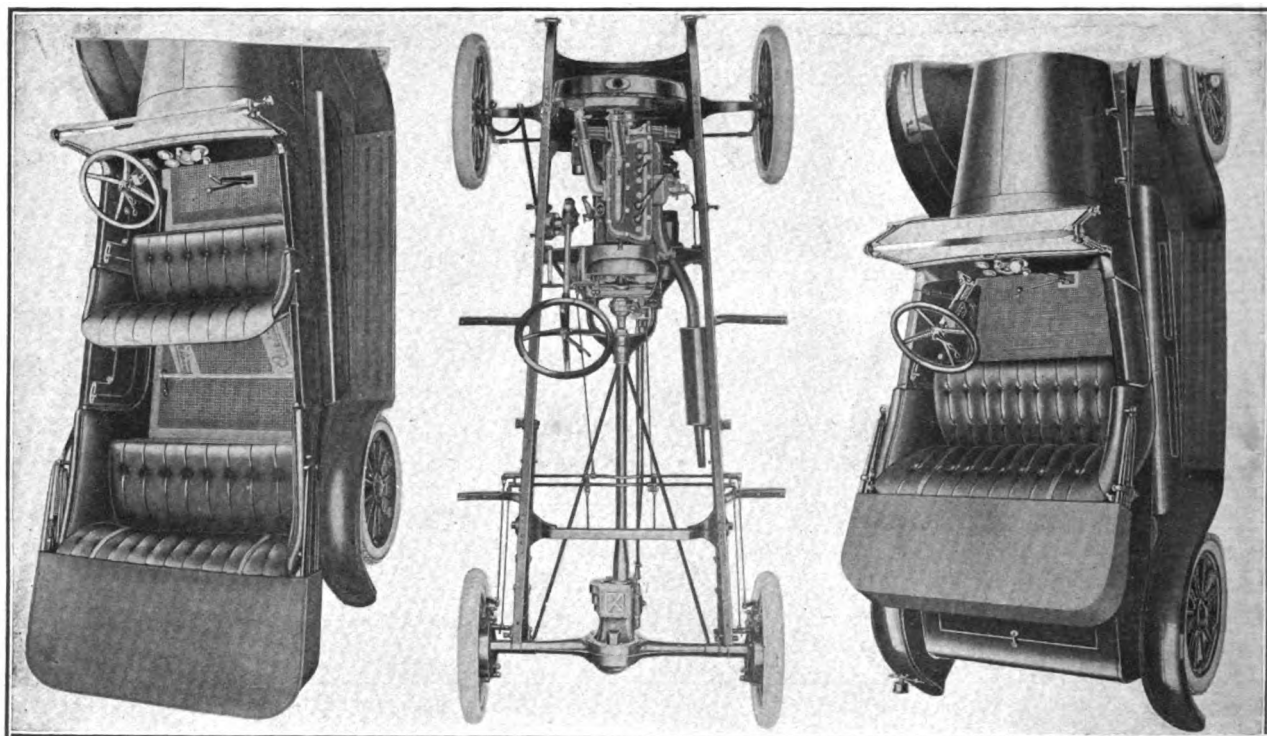
The ignition is by high-tension magneto, which is installed entirely separate from the starting and lighting system. No dry cells are required for starting. Cranked by the electric starter the motor starts on the magneto. The wiring has been reduced to the simplest possible arrangement.

Springs under the clutch facing assure easy and gradual engagement.

Instead of being carried with the motor the three-speed selective sliding gear transmission is mounted on the rear axle in unit with the differential. There are three forward speed ratios and reverse. The gears are double heat treated and are mounted on roller and annular ball bearings.

Removable Rear Axle Shafts.

The rear axle is a floating type with four bevel differential gears and a removable shaft which runs on annular ball bearings. The brakes are much larger than is usual for a car of this weight. The service set is external contracting



Interior Views of the Overland Model 75 Five-Passenger Touring Car (Left) and the Roadster (Right) Showing Roomy Compartments; Chassis of Model 75 at Centre.

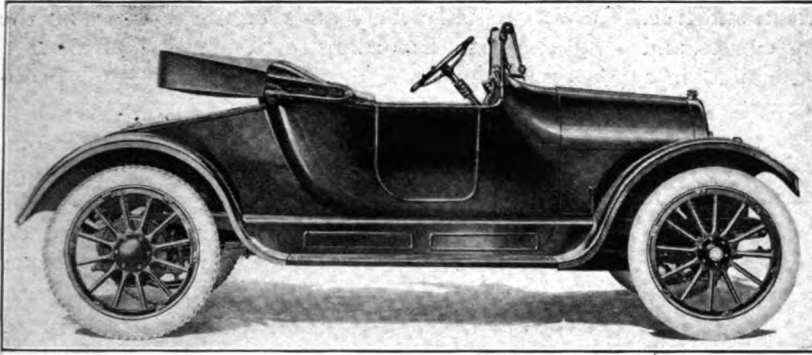
Similarly the lubrication system is the simplest possible—a straight splash arrangement with a plunger oil pump which keeps the oil in the crank case at a constant level under all conditions. A screen is inserted at the pump well to keep the oil constantly strained. A float gauge indicates the quantity of oil in the crank case.

The carburetor is an improved design with a hot air attachment to warm the gas. The arrangements for adjustment are very simple.

Overland practise is followed in the leather faced cone clutch, which is equipped with a simple clutch brake to facilitate gear shifting.

on drums $12\frac{3}{8}$ inches diameter and $1\frac{3}{4}$ inches width, while the emergency set is internal expanding in drums 12 by $1\frac{3}{4}$ inches. Both sets operate on rear wheel drums. The brake lining is a thick asbestos fabric with a woven wire brass core.

Semi-elliptic springs 36 by $1\frac{3}{4}$ inches are used in front and the cantilever springs at the rear are 42 by two inches. The connection to the axle is at the rear end of the spring instead of in the middle. The force of the shock from a road obstruction is not sent straight upward, as is the case with the elliptic spring, but its direction is



The Overland Model 75 Roadster, Which Sells at \$395.

also backward, tending to make the wheel roll over the bump. The deflexion and recoil is much less marked than with the usual double-acting springs.

The steering control is a worm and full gear of hardened steel, which is adjustable. Having four times the surface it has four times the life of the ordinary steering sector. It has adjustable ball thrust bearings. The 17-inch steering wheel is at the left side of the front compartment and as the standard is short before it enters the dash, it is not subject to vibration.

Electric control buttons are placed on the steering column, so it is not necessary to lean forward to reach them. To start the motor the starter button in the floor is depressed. There are two buttons in the switch box for the lighting circuit, so that the headlights may be either bright for country driving or dimmed for driv-

ing in town. The gear shifting and brake levers are placed so that they do not interfere with passage in or out of the car and the position of the steering wheel allows plenty of room to enter or leave at the right or left as desired.

The clutch and brake pedals are operated with a minimum of effort. They are adjustable to the reach most convenient for the driver and large, roughened surfaces insure a sure foothold.

There is a small rest to steady the foot on the accelerator pedal.

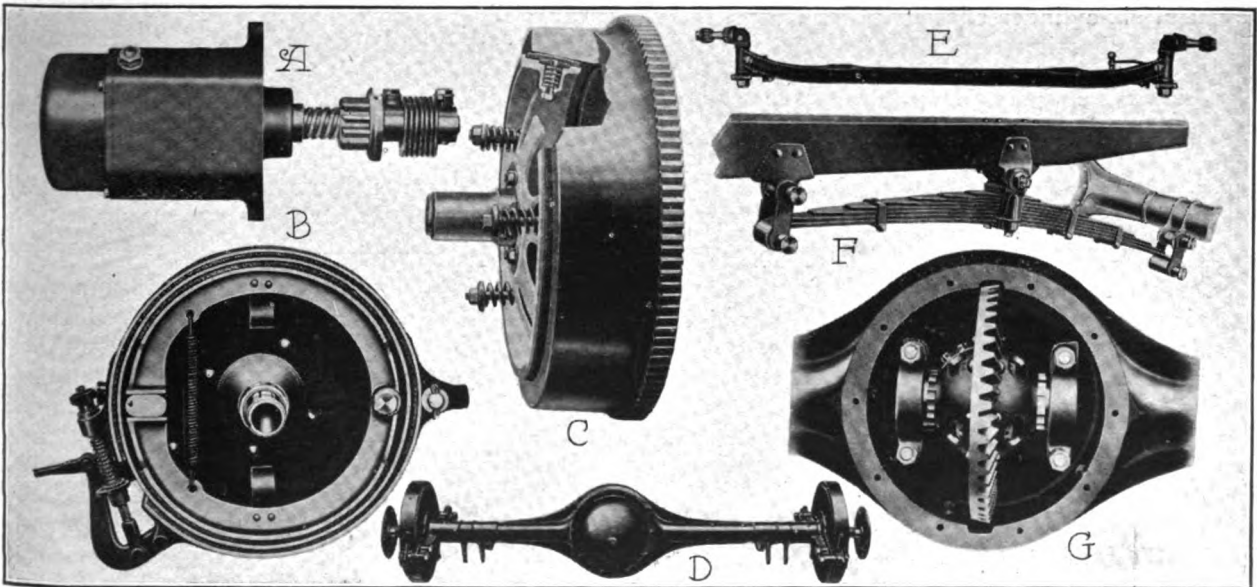
Instruments Are Handy.

The arrangement of the indicating instruments, including the speedometer, is such that it is scarcely necessary to take the eyes off the road in driving. A small electric light illuminates them at night. This light is connected in series with the tail light so that it cannot burn if that light is out.

At the right of the instruments is a carburetor button to provide a richer or a poorer mixture as the operation of the motor may require.

The body is long and low and is a streamline type. The front edge of the radiator is rounded and the hood slopes gradually into the beautifully curved cowl. The back also is gracefully rounded.

There are no projecting door handles or



Components of Overland Model 75—A, Starting Motor; B, Extra Large Brake; C, Flywheel and Clutch Out Away to Show Spring Stud; D and E, Rear and Front Axles; F, Cantilever Spring Assembly; G, the Large Bevel Driving Gear.

hinges and the running boards are clean and free. The fenders are long, with sweeping curves and rounded surfaces. The built-in windshield is a part of the car and not merely a piece of attached equipment.

The car is upholstered in fabrikoid, with deep, soft hair and springs of the right tension. The wide U doors have large pockets on the inside. The back of the front seat is covered below the robe rail. There is a tool compartment under the rear seat.

The equipment includes a two-unit, six-volt electric starting and lighting system, with head, tail and dash lamps, and with headlight dimmers and an ammeter to register the amount of electric current. The one-man top is of mohair. The curtains are fastened from the inside. The built-in windshield is of the ventilating rain vision type. There is a magnetic speedometer and electric horn, combination tail light and license bracket, hinged robe rail, foot rest, tire carriers in the rear, extra demountable rim, full set of tools, tire repair kit, jack and pump included in the equipment.

APPERSON "SPEED-BOY" ROADSTER.

Following the purchase by the fire department of Elizabeth, N. J., of three four-passenger Apperson roadsters, the company has announced that it will build regularly a powerful roadster of the racing type, to be known as the "Speed Boy." The four-passenger body will be mounted on a powerful six-cylinder chassis, preserving a ratio of body to chassis weight which is close to that of the regular racing cars. The car will be able to do 60 miles an hour. It is anticipated that the model will be in demand with fire department chiefs, and that people who demand fast travel will favor it.

PEERLESS EIGHT AT \$1890.

It is reported in Cleveland that the new eight-cylinder car to be produced by the Peerless Motor Car Company will sell for \$1890, and that deliveries of demonstrators will begin in December. A new two-ton truck is being designed and will shortly be added to the line which the company has always produced.

CONVICT ROAD WORK NOW APPROVED.

The use of convicts on the road has now passed a period of hysterical wrangling and is

now accepted nearly all over the country as the right system, according to E. Stagg Whitin, who is giving a new course in practical penal problems at Columbia university.

He said that the efficiency of the convict road gang differs very greatly with different gangs and that he believed that the application of the efficiency records of the free gangs working on the roads of Wisconsin would furnish a proper standard for the judgment of their efficiency.

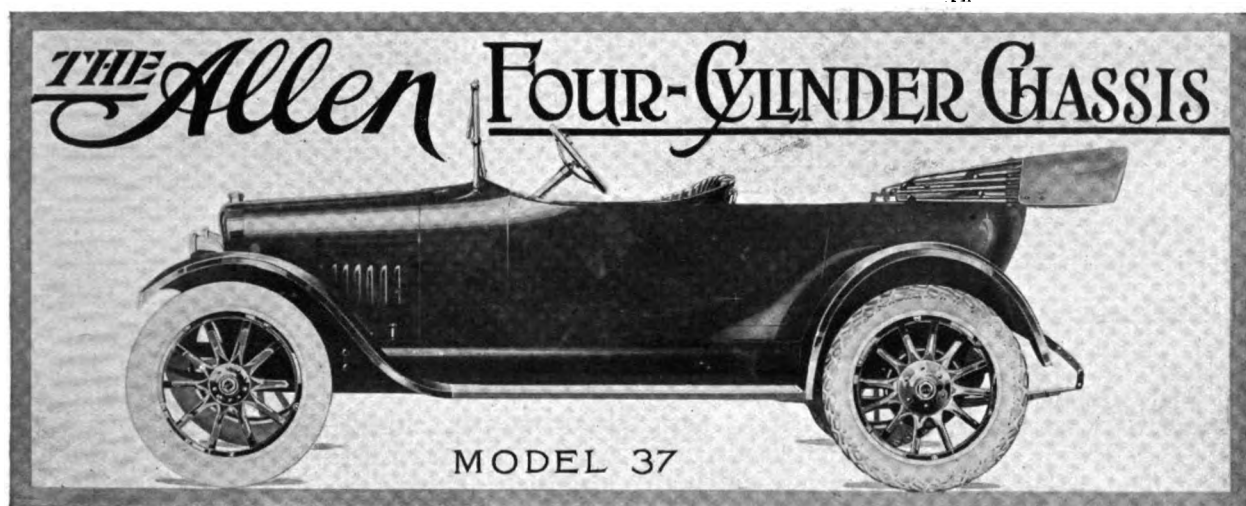
Incentive must be presented before good work can be produced.

"Coop any of us up in a stuffy jail for several months," said Mr. Whitin, "arraign us for trial amid the excitement of what we misname justice, then take a few months of breaking our spirit in prison surroundings and there is little likelihood that the thing we call 'ginger' will be very apparent. There is definite need of building up if the convict is to return to society and make good. The great need is for the foreman of a convict road gang to throw his shoulder to the task and inspire his gang with a desire to be like him. The problem lies in securing such men as foremen of the road gangs."

OLDSMOBILE SALES CONFERENCE.

The annual sales conference of the Oldsmobile sales force was held at the Lansing factory recently. Branch heads and district representatives spent five days going over the product and the sales plans. They were addressed by representatives of the parts and equipment makers, among whom were W. H. Mooney, installation engineer of the Dayton Engineering Laboratories, which manufactures Delco starting and lighting systems, and William Far, who represented the Johnson Carburetor Company. The conference was directed by J. V. Hall, sales manager.

In the Oct. 10th issue of The Automobile Journal there appeared a discussion of the theory of the twin-six motor, which was based upon the paper and charts presented to the members of the Society of Automobile Engineers at a meeting of the Detroit section by J. G. Vincent, vice president of the Packard Motor Car Company. The Class Journal Company, New York City, publisher of Automobile, a magazine devoted to motor vehicle interests, states that the two scales illustrating Mr. Vincent's discussion and used on page 55, were copyrighted by that company and insists that credit be given to them.



FOR 1916 the Allen Motor Car Company, Fostoria, O., is concentrating on a single chassis, which will sell either as a roadster or as a touring car for \$795. Previously the company built five models, but unanimity of demand has brought about concentration on a single type.

The chassis has an attractive boat line body, an Allen-Sommer long stroke motor, made especially for and used exclusively in Allen cars, and its equipment is made by some of the most prominent producers of accessories and fittings. It is exceptionally light, weighing only 2300 pounds, and for that reason should be economical.

The production of Allen cars has increased three-fold in the past two years, and the sales representation has expanded so that instead of being on sale in seven or eight states, the Allen is now obtainable in 41 states.

The motor is an Allen-Sommer long stroke, four-cylinder, four-cycle, water cooled, L head type, the cylinders, which are cast en bloc, having bore of $3\frac{3}{4}$ inches and stroke of five inches. An eighth of an inch has been added to the bore since last year to insure an ample power production.

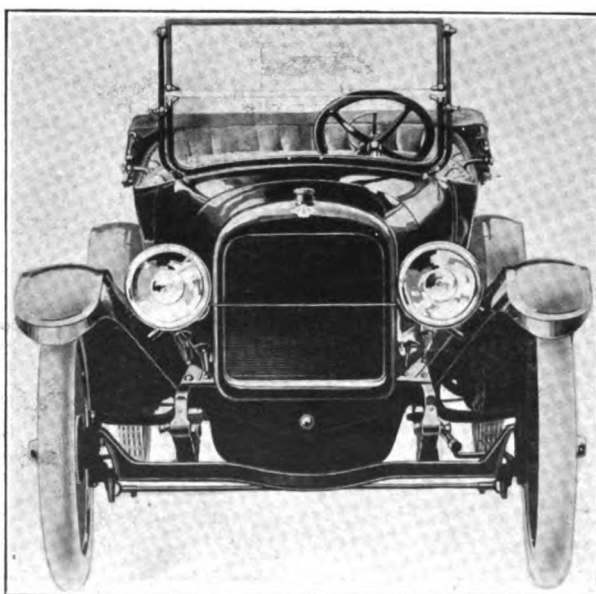
The piston displacement is 221 inches. The

crank case is aluminum-Lynite. The carburetor is a special Stromberg with an air control lever on the dash, within easy reach of the driver. The valves are entirely enclosed to obtain protection and quiet running. They are interchangeable and are very accessible. The valve push rods are adjustable.

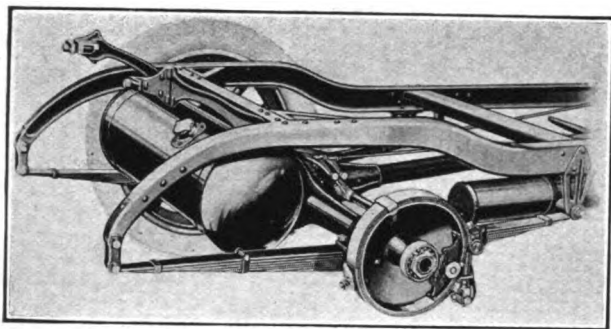
The cooling is by thermo-syphon circulation through a tubular radiator, which is enclosed in a rounded shell. The lubricating system is a combination of force feed and constant level splash. The starting, lighting and ignition equipment is the Westinghouse two-unit system. Ignition is a generator-battery type. The headlights are fitted with dimmers and Champion spark plugs are employed.

The carburetor is a special Stromberg with an air control device on the instrument board. There is a hot air connection with the exhaust manifold, which is designed to increase the efficiency of carburetion, especially in cold weather.

The motor bearings are die cast from S. A. E. formula hard bab-bitt. The diameter of all crankshaft bearings is $1\frac{1}{8}$ inches. The rear bearing is $4\frac{1}{2}$ inches long, the front bearing $3\frac{3}{4}$ inches long and the crank pin bearings are



Front View, Showing Boat Line Designed Body of Allen Model 37.



Rear Spring Suspension, Allen Model 37.

two inches diameter. The front camshaft bearing is two inches diameter by $2\frac{3}{4}$ inches length. All other motor bearings are proportionately large. The timing gears are helically cut with teeth of one-inch face.

From the motor to the transmission gearset the power is transmitted through a leather faced cone clutch, $13\frac{3}{4}$ inches diameter and $2\frac{3}{8}$ inches wide. It is accessible and can be adjusted without difficulty. It is equipped with a ball bearing release yoke. An S. K. F. self-aligning pilot bearing is employed.

The transmission gearset is carried in unit with the motor and clutch and has three forward speed ratios and reverse. A double row of S. K. F. ball bearings are employed on the main shaft.

The steering gear is a worm and full gear type, which has twice the wearing surface and consequently a possibility for twice the life of the ordinary sector.

The worm operates against ball thrust bearings. The walnut steering wheel is 17 inches in diameter.

The front axle is a one-piece I

beam drop forging of carbon steel. It is carried on large ball bearings. The frame is a channel section of pressed steel with four cross members.

One Universal Joint Used.

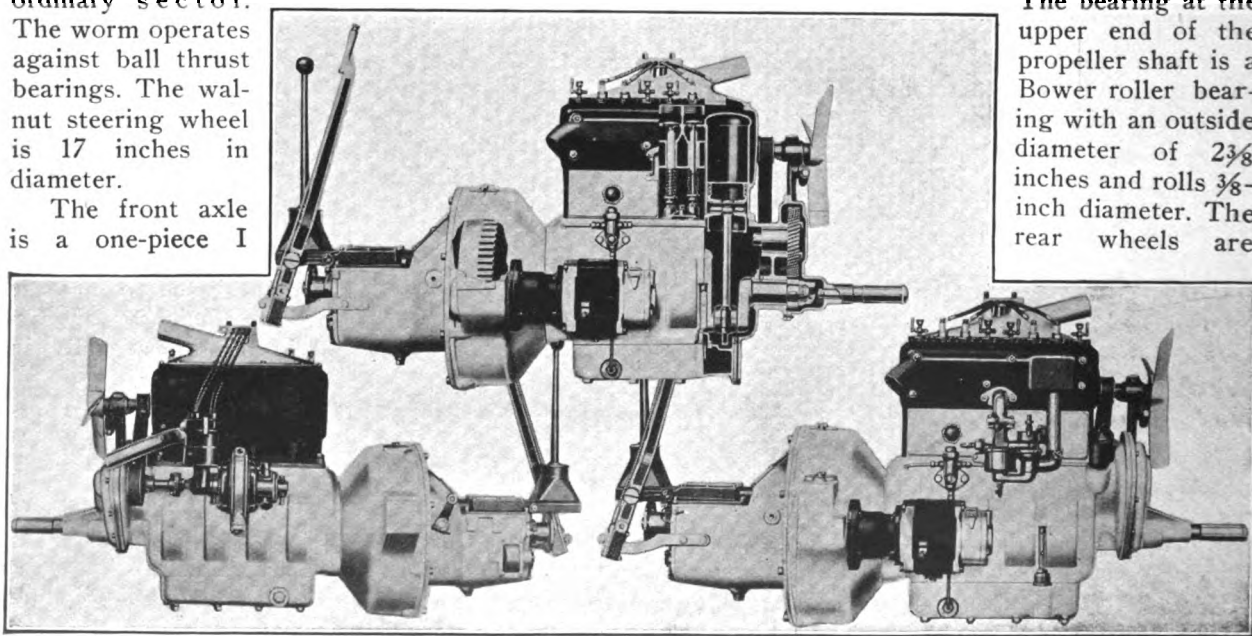
There is only one universal joint in the propeller shaft. The rear axle is a full floating type with a pressed steel housing on which the entire weight of the car is carried.

The service brake is an external contracting type, operating on rear wheel drums $12\frac{1}{4}$ inches diameter and two inches width, and the emergency brake is internal expanding, with shoes 12 inches face diameter and $1\frac{3}{4}$ inches width. The brake pressure equalizers are equipped.

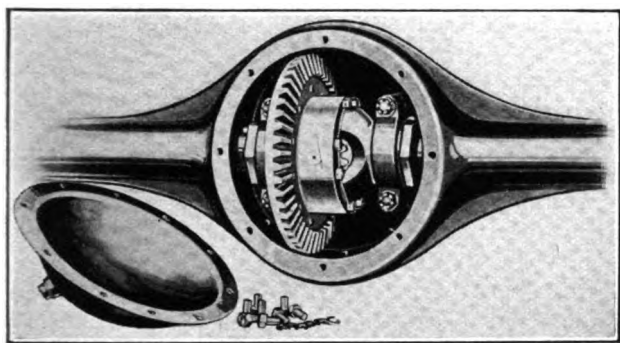
A four-pinion bevel gear type differential gearset is employed in which the gear material is $3\frac{1}{2}$ per cent. nickel steel, drop forged and heat treated. An opening in the housing is provided through which the complete differential assembly may be removed. The large driving gear is machined from a carbon steel drop forging with 48 teeth of 5.3 pitch. The driving pinion of $3\frac{1}{2}$ per cent. nickel steel has 12 teeth. Both driving gears are carefully heat treated and hardened and adjusted to run perfectly quiet. The driving gear adjustments are accessible through the cover plate.

The differential gearset is mounted on Gurney ball bearings having $3\frac{3}{8}$ inches outside diameter with $7/16$ -inch balls. The pinion bearing is a Gurney, $3\frac{1}{8}$ inches outside with $\frac{1}{2}$ -inch balls.

The bearing at the upper end of the propeller shaft is a Bower roller bearing with an outside diameter of $2\frac{3}{8}$ inches and rolls $\frac{3}{8}$ -inch diameter. The rear wheels are



Unit Power Plant of Allen Model 37—Top View Showing Interior of Allen-Sommer Motor and Westinghouse Motor Installation.



Differential Used with Allen Full Floating Rear Axle.

supported on S. K. F. double row ball bearings 3 15/16 inches outside diameter with 1/2-inch balls. The shafts are chrome nickel steel and are heat treated.

The universal joint is a split ring type constructed entirely of drop forgings. All wearing parts are carefully hardened and ground and enclosed in a pressed steel housing of ball and socket type. The slip joint connecting the universal with the propeller shaft has six splines. The rear system can be separated from the unit power plant by removing the universal joint.

Generous Spring Equipment.

The springs are made of high carbon steel, double heat treated. The rear set is semi-elliptic, double acting, 55 inches long and two inches wide. Under the rear of the body is a 13-gallon gasoline tank from which fuel is fed to the carburetor by the Stewart vacuum system. The wheels are 32-inch, artillery type, with Firestone demountable rims, and one extra rim, equipped with 32 by 3 1/2-inch tires front and rear, and non-skids on the back wheels.

The wheelbase is 112 inches and the tread 56 inches. The road clearance is 10 1/2 inches. The steering gear is a full worm type, providing four times the surface that is available when a sector is used. The worm is operated on ball thrust bearings and the walnut steering wheel is 17 inches diameter.

The body seats five passengers in great comfort. It is a handsome boat line design, with wide doors, concealed hinges and flush type upholstery. The floor boards are covered with aluminum bound linoleum. Both front and rear compartments are sufficiently spacious to afford ample leg room.

On the instrument board are the speedometer, switches for ig-

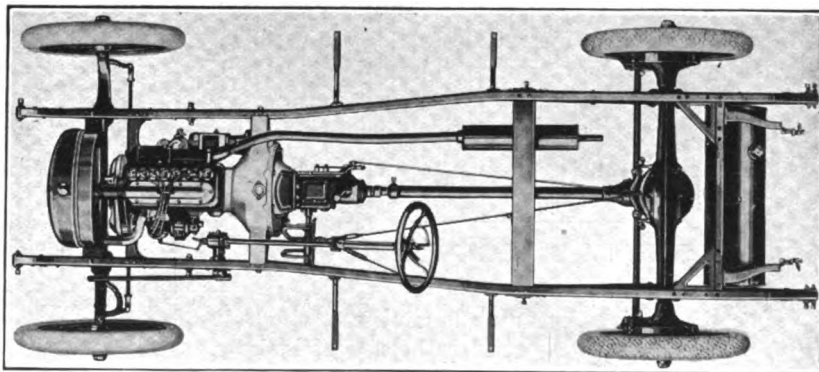
nition, lighting and starting, the ammeter and the air control lever. Crowned fenders are used and the running boards are aluminum bound. The fenders and radiator are black japanned. The body, hood and wheels are olive green. The trimmings are nickel and aluminum.

The equipment includes electric engine starter, electric headlights and dimming switch. There is a combination electric tail and license bracket light. There is an electric horn and a trip and season odometer, and there are tire irons at the rear and an extra demountable rim.

The windshield is a rain vision plate glass ventilating type. The one-man mohair top with side curtains and slip covers is designed to fit the car and is made in the Allen factory. A tire repair kit and a compound pump completes the equipment.

BANK HAS FORD CLUB PLAN.

To encourage savings depositors many banks have operated Christmas club plans, by which people deposited a small amount each week in order to draw it out at Christmas time when they especially wanted money. Wilbur F. Beal, treasurer of the Dorchester Trust Company, Boston, has worked out a similar plan to aid in the purchase of Ford automobiles. The depositor agrees to place \$10 a week in the bank for 30 or 35 weeks. The bank pays interest on the deposits, but the depositor agrees not to withdraw any of the money until the time is up. Then if he decides he does not want a car it will be paid back to him with interest. If he wants the car he will be sent to a dealer, who will turn the car over to him. If he wants extras he agrees to continue his \$10 weekly payments. If depositors want a more expensive car arrangements may be made to carry along the deposits.



Acropplane View of Allen 37 Chassis.

FIVE MILLION CARS IN 1920.

IT IS the prediction of A. R. Erskine of the Studebaker Corporation, that by 1920 there will be 5,000,000 automobiles in use in the United States. The number today is about 2,250,000.

The owner of a large interest in one of the leading companies has this to say about the future demand for cars:

"When you stop to think of it there are few articles for which such a demand exists as for the motor car. The automobile is a product which every one, man, woman and, above a certain age, child, wants. There are not many products in this class. Everyone who has the price, for instance, does not want a typewriter or an adding machine. Most articles have a limited field, even though everyone could afford to buy them. But with the exception of a few cranks, very limited in number, every grown up can and does enjoy motoring and wishes to own a car. That is why every reduction in price enlarges so rapidly the size of the automobile market. We have not yet approached the saturation point in this country and increases in motor car production seem to me certain for many years to come."

JEFFERY ORIGINATED "SEDAN."

The Thomas B. Jeffery Company, which has just produced a new Sedan on its four-cylinder chassis, points out that the term Sedan was first applied to a motor car in 1911, when the company produced an enclosed car without fore doors, access to the front compartment being had from the rear through divided front seats. The Jeffery company conducted a contest to secure a name that would attractively describe the car and Sedan was chosen. Today the term applies generally to all enclosed cars of this type.

The present Jeffery Sedan has the divided front seats, extra wide windows, long unbroken lines and an excellent finish. The price is \$1165. The Sedan provides the owner with a summer as well as a winter car, as the top is detachable. The car looks in every way like a permanent enclosed coach.

AUTOMOBILE RESERVE CORPS.

The Wolverine Automobile Club was the first in the United States to tender the use of its cars to the government in time of war or other national catastrophe. The movement has since

been taken up by many clubs and has received the support of the governors of New York, Washington, Maryland, Wisconsin, Arkansas, Wyoming, Nevada and Montana. In December a big meeting will be held to discuss the advisability of forming the club into an automobile reserve corps. Each motorist will be expected to pledge his car and himself in case of need. He will be given a radiator insignia.

NEW AFRICAN ALCOHOL FUEL.

Last spring the Royal Automobile Club tested in England a fuel originating in Natal, South Africa, which was a combination of alcohol and ether and was known as natalite. It showed very excellent qualities as compared with gasoline and if the excise restrictions on alcohol were removed could compete successfully with gasoline in many markets.

Another such fuel known as ethol has now been produced and has recently been tested by Prof. John Orr of the School of Mines and Technology, in the Transvaal. He reports that .165 gallon of ethol is consumed per brake horsepower per hour as compared to .125 gallon of gasoline. This is about the same or a little less than the efficiency that was secured from natalite.

COMING EVENTS.

November.

Nov. 29-Dec. 4—Electric prosperity week.

December.

Dec. 6-11—Show, Springfield, Mass.

Dec. 14-17—International Road Congress, Worcester, Mass.

January.

Jan. 1-8—Show, New York City.

Jan. 7-11—Convention, National Association of Automobile Accessory Jobbers, New York City.

Jan. 3-9—Importers' salon, New York City.

Jan. 8-15—Show, Philadelphia.

Jan. 8-15—Show, Cleveland.

Jan. 15-22—Show, Detroit.

Jan. 17—Show, Wilmington, Del.

Jan. 17-22—Show, Rochester, N. Y.

Jan. 18-22—Show, Baltimore.

Jan. 22-29—Show, Chicago.

Jan. 24-29—Show, Buffalo.

Jan. 29-Feb. 5—Show, Minneapolis.

February.

Feb. 7-12—Show, Kansas City, Mo.

Feb. 9-12—Show, Peoria, Ill.

Feb. 14-19—Show, Des Moines, Ia.

Feb. 19—Show, Newark, N. J.

Feb. 21-26—Show, Syracuse, N. Y.

Feb. 21-26—Show, South Bethlehem, Penn.

Feb. 28-March 4—Show, Paterson, N. J.

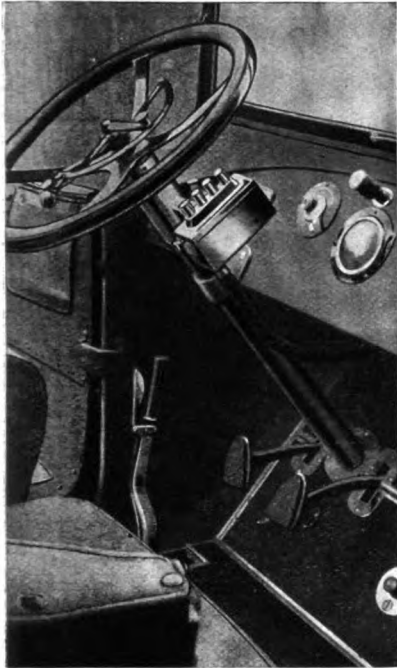
Feb. 29-March 4—Show, Fort Dodge, Ia.

March.

March 4-11—Show, Boston.

THE CUTLER-HAMMER MAGNETIC GEAR SHIFT.

ELECTRICITY has been one of the chief agents in lessening the discomforts and dangers in the operation of automobiles. It has



Operating Push Buttons of C-H Magnetic Gear Shift Are Mounted Under Steering Wheel.

been successfully applied to the lighting and starting of the car, and has recently been adapted to the shifting of gears. It would seem that the troublesome hand lever gear shift is doomed to extinction in future automobile construction.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has de-

vised what it designates as the C-H magnet gear shift, in which the principle of electro-magnetism, or solenoids, are employed to shift the gears. This principle is one of the most reliable known in the electrical arts, and is one of the most simple and easily understood.

A solenoid can be likened to the horseshoe magnet with which children are wont to pick up needles and like steel or iron objects. It has this difference, however, that while the magnet has permanent attractive force, the solenoid is energized with the same quality at will.

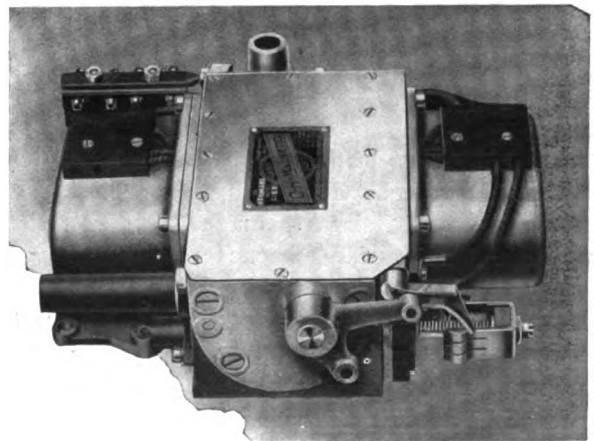
Anyone can contrive a practical solenoid out of simple materials, and demonstrate its remarkable qualities. Wind about six yards of No. 20 cotton covered copper wire tightly on a spool, having the wire wound much like the thread that was originally upon the spool. To hold the wire in position, cover it with a piece of cloth, and lay bare both ends of wire for about an inch. Attach one end to a dry cell battery terminal. Place a large iron nail in the spool's opening, permitting one end to project further than the other. Touch the free end of the wire to the other bat-

tery terminal and the improvised solenoid will become energized with attractive force and cause the nail to move to the exact centre; that is, its ends will project at equal distances on both sides of the spool. This is one of the wonderful principles of electro-magnetism, and is one that never fails in operation. The movement is practically instantaneous and is absolutely positive.

It is this principle upon which the C-H magnet gear shift is based, with variations. The engineers have adopted four solenoids in their system, there being one for each speed with which the majority of automobiles are provided. These solenoids are arranged in two sets of two each, and their operations can be traced in the accompanying diagram, Fig. A. As can be seen steel shafts extend through the solenoids, which are connected by wires with the control buttons. Each button and its corresponding solenoid is numbered alike.

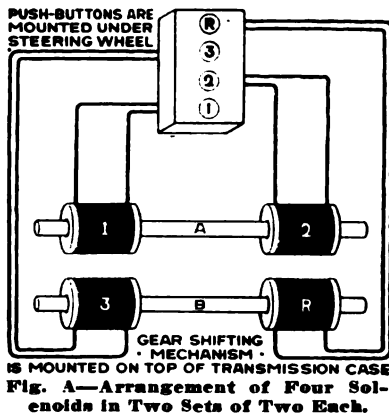
In operation, the driver pushes button No. 1, and instantly solenoid No. 1 becomes energized and pulls the shaft to the left. In changing to the intermediate speed, No. 2, the operator pushes button No. 2, and the shaft and gears move to the right. Fig. B more clearly illustrates the action, it showing the rod connected by a yoke with the gear shaft.

The foregoing is a rough description of the action and is intended to make the operating principle as clear as possible. As a matter of fact, the



The Gear Shifting Mechanism of the C-H Magnetic Gear Is Mounted on Top of Transmission Case.

push upon the button does not immediately energize the solenoid; it only partially closes the circuit to the solenoid selected and prepares for the



wishes to change in advance of the actual shifting operation.

The value of this is obvious. As an instance, consider a car going up a steep hill on high. The driver may believe he will have to drop back to intermediate speed before reaching the top, and pushes button No. 2, which causes the solenoid to become energized and ready for instant service, which is achieved only by depressing the clutch pedal. If the top is reached without the necessity of a change, the button can remain depressed, if desired, the shift being ready whenever circumstances require it.

The only effort required to change gears with the C-H magnetic gear shifter is a slight pressure with the finger on the push button and the ordinary effort required to release the clutch by depressing the clutch pedal. The hand lever can be removed from the car, affording a clear floor space.

The position of the operator is always the same, erect behind the steering wheel, with both eyes concentrated on the road and both hands on the steering wheel. It requires but a fraction of a second to drop the right hand to the gear shift buttons, which are attached by a bracket to the steering column directly under the steering wheel. The changing of gears is always made quickly and noiselessly, because it is impossible to lose the momentum. The change is always positive, as the magnetic pull is stronger than ordinary muscular effort. Still another advantage is that it is impossible even for the beginner to strip the transmission gears, as the shift cannot take place until the clutch pedal is depressed.

change of gears. The actual shifting takes place when the operator depresses the clutch pedal to the floor board. This arrangement is so that the operator can select the gear to which he

Comprehensive tests have shown that it requires less current to operate the gear shifter than is required to give a warning blast on an electric horn. If a start was made from New York with a 12-volt, 80-ampere battery, gears could be shifted every half mile to San Francisco without recharging the battery. Under ordinary circumstances the battery that supplies current to the gear shifter is constantly being recharged by the generator. Should, however, some accident befall the battery or the wiring to the shifter, the gears can still be shifted by hand in the usual manner by inserting the gear shifting lever into the socket provided for it. It should be borne in mind that the installation of the magnetic gear shift does not necessitate any change in the transmission.

REO TESTING EQUIPMENT SHOWN.

The Reo Motor Car Company, Lansing, Mich., always is willing to admit visiting engineers, even those from rival factories, to study its production methods. A new Reo development is an electrical instrument for testing rear axles. One motor drives the axle as it is driven by the gasoline engine in the car and the other drives it from the wheel end as it is driven when the car is coasting down hill. The purpose of this is to allow the engineers to eliminate the noises made by the axle in coasting, as well as in ordinary use.

The Reo open house policy of showing such equipment to all who call is the idea of Vice President Scott, who believes that the company learns as much from the visitors as it teaches them. He says he has found that most companies which make a secret of their methods do it because the methods are not up-to-date, and that they wish to conceal the fact.

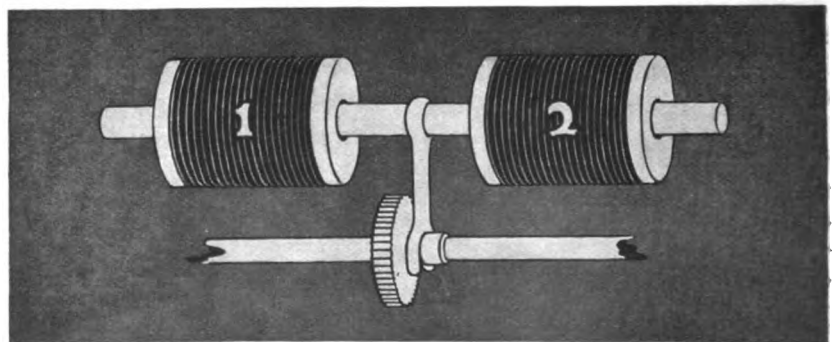


Fig. B—Illustrating How Solenoids Act to Move Gear Shaft to Right or Left.

ENGLISH TARIFF AFFECTS CANADIANS.

DURING the discussion of the English budget, which imposes a duty of 33 1/3 per cent. on imported passenger automobiles, motorcycles, moving picture films and similar products, an amendment was introduced to exempt from the act such importations as originated in the British colonies. This was defeated.

The result is that Canadian manufacturers can do business in England only on terms similar to those which must be met by United States manufacturers. This step was probably taken because of the knowledge that most Canadian cars are made in factories which are branches of United States producers.

At the same time an amendment was offered removing the duty from products made by the allies of England in the present war, but this also was rejected. The chancellor, however, stated emphatically that the duty was not intended as the institution of a protective policy, but was purely and simply a revenue measure, which would expire next July and would then either be discontinued or renewed.

NEW ABBOTT-DETROIT SIX.

Announcement is made that a new Abbott-Detroit model, a six-cylinder, will soon be in the field as a companion to the Abbott-Detroit "Eight-Eighty," which has been produced this season by the Consolidated Car Company. It will be low in price as compared to previous productions of the company.

This car is designed and produced under the direction of M. J. Hammers, general manager of the company, who has been responsible for all the Abbott-Detroit cars that have previously been made. It will have wheelbase of 122 inches and seating accommodations for seven passengers. The motor will be a Continental with 3 1/4-inch bore by 4 1/2-inch stroke. The six cylinders and the upper half of the crank case are cast en bloc from a special grade of reverberatory air furnace iron. The cylinder head is cast separately and is easily removable for the purpose of regrounding the valves or removing carbon.

The car will be light and economically operated. Exceptionally long semi-elliptic springs will be employed. The multiple dry disc clutch will be equipped with an automatic brake to insure easy and noiseless gear shifting. The start-

ing and lighting system is of the two-unit type, with a Bendix drive. A high-tension battery system with auxiliary dry cells is employed. The new car will be known as the "Six-44" and will sell for less than \$1200.

STUDEBAKER RELIABILITY RUN.

In every part of the country Studebaker cars taken from the regular shipments from the factory have been engaging in a series of 1000-mile reliability runs. The arrangements required 250 miles to be made in a day of 12 hours under all sorts of road conditions, and the 1000 miles to be made in one week. All of the cars came inside of this limit, the average being about 10 hours for the 250 miles. The Detroit car ran to Toledo and back twice, making a distance of 250 miles at 42 miles an hour, and this was the greatest record for speed.

WANTS "CHUCK HOLE" CLUB FORMED.

A proposal is made by C. A. English, dealer in King cars at Los Angeles, to form a national organization to be known as the "Chuck Hole" Club. The insignia would be a small spade and each member would stow away somewhere in his car a shovel. When he encountered on the road a bad hole, which might be dangerous to fellow drivers, he would fill the hole as best he could and then report it to the highway officials. If such a report were made, Mr. English believes, and an accident followed later because of the hole, a civil action could be successfully prosecuted.

WOLVERINE CLUB HELPS POLICE.

Alfred O. Dunk, vice president of the Wolverine Automobile Club, has sent out hundreds of cards to club members asking them to pledge themselves to aid the police in enforcing the traffic ordinances. Pledges have been received from 500 members to report all violations which they see, furnishing the police with car numbers and an account of the occurrence. It is hoped that the campaign will result in cutting down accidents and enable the police to do their work without a large increase in the traffic force, which the taxpayers object to.

INDUSTRIAL HAPPENINGS AND COMMENT.

THE Allen Motor Company, Fostoria, O., has been compelled by increased volume of business to add to its plants. A new building was recently built at Bucyrus, O., and another is under way and nearly completed at the main plant at Fostoria. It is to be a special assembly department, and is shown in the accompanying illustration as partly constructed. The company's force of workmen has been working day and night for several weeks past. For 1917 an output three times as large as that of 1916 and 15 times as large as that of 1914 is anticipated.

Hugh Chalmers, president of the Chalmers Motor Company, recently suggested while speaking to the entire office and factory force of the company that a Young Women's Chalmers Club and a Young Men's Chalmers Club be formed to combine fraternal and educational features. In appointing the committee Mr. Chalmers suggested that civic work be taken up with the purpose of having at least "as many churches as saloons in Detroit." Under the rules everyone will be eligible and a membership of over 2000 young men alone is expected. The members will conduct the clubs and no Chalmers officer or foreman will hold office.

The Haynes Automobile Company, Kokomo, Ind., following out its custom of making seasonable gifts to its employees at Thanksgiving time, this year distributed a large quantity of apples, there being enough in all to

tained about 30 of the leading jobbers in automobile accessories and supplies, who attended the convention of the National Association of Accessory Jobbers at Kansas City. They were taken from Kansas City to St. Louis in a special train and conveyed from the depot to the McQuay-Norris plant in 20 automobiles for an inspection of the factories. A banquet at night concluded a day of pleasure spent in touring the city and visiting the sights of interest in the vicinity.

The Hartford Suspension Company, Jersey City, N. J., maker of Hartford cushion spring shock absorbers, is distributing the November number of its house organ, "Auto Comfort." Among the many useful suggestions for motorists it contains is that electric light bulbs for headlights should be frosted or enamelled. This removes the glare, but does not appreciably reduce the illumination. The book presents some lively verse and interesting illustrations. It tells the story of the shock absorber and tells why it is an improvement on the best equipment of car springs.

The Goodyear Tire and Rubber Company's salesmen have a new incentive to intensive sales work. Those achieving sales that are out of the ordinary in difficulty and means are decorated with the "Order of the Hearse," much after the fashion of European soldiers. The order originated with the experience of a salesman in a small Illinois town, where the only live prospect was a man

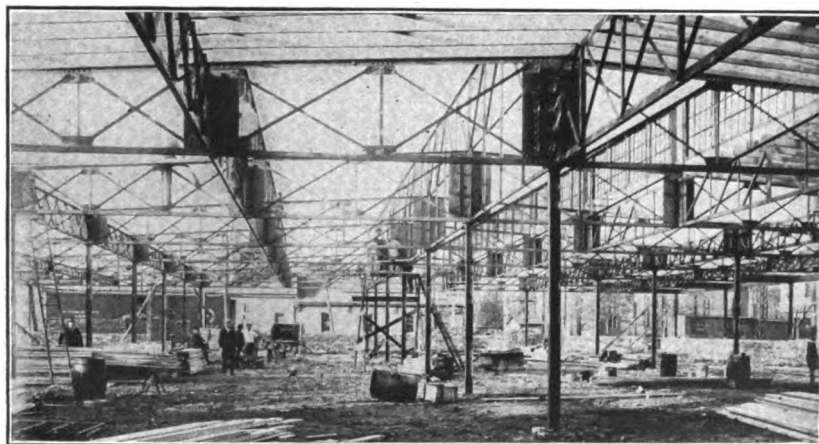
who combined the occupations of undertaker, livery man and automobile and accessory dealer. He approached the prospect while the latter was repairing a motor and received the response that he had no time to talk because the prospect must wash the hearse and go out on a call. The salesman volunteered to do the washing in exchange for an opportunity to demonstrate the worth of Goodyear goods. His offer was accepted and a satisfactory sale was made later. The decoration growing out of this incident is a medal stamped with the figure of a man wearing rubber boots and washing a hearse. The motto is "To the stars through difficulties."

The Packard Motor Car Company, Detroit, has added more than 500 employees to its force since Nov. 1, and still the employment bureau is working at top speed to meet the demand for men in nearly every division of the factory. The force now numbers well over 10,000 people. Less than 300 of these are women. The payroll for October was \$773,879, and for November it will be, considerably

more than \$800,000. Indicative of the economic influence exerted by the Packard company in Detroit is the statement that at least half of the men are the heads of families and each directly supports three persons, which, on that basis, would make a community of 30,537, not to mention the tradesmen who supply these people. During October 477 carloads of material, weighing 3,273,560 pounds, were received. A vigorous effort is being made to prevent any further postponement of deliveries of Twin Sixes, which have been delayed by raw stock not being received promptly.

The Jones Motor Car Company, Wichita, Kan., is reported as having bought the old Burton car works and 73 acres of ground for the sum of \$100,000. The property has been owned by the American Warehouse Company for the past 10 years. The Jones company plans to install factory equipment for the manufacture of automobiles after the plant has been remodelled and renovated.

F. A. Vollbrecht, vice president and general manager of the King Motor Car Company, has returned to Detroit from a tour of King dealers, and reports that from his personal observation the policy of the company to make its announcement of models in the fall or winter months is a success. Since the debut of the improved five-passenger, eight-cylinder King, the company has had an avalanche of orders.



Special Assembly Building Being Erected at the Fostoria Plant of the Allen Motor Company.

afford a fair winter's supply for every individual, from President Haynes down to the newest office boy. The apple crop in Indiana was abundant this year and the fruit was particularly good. The apples were brought in by the farmers, who were taken on a tour through the factory, and then sent out to deliver their loads.

W. C. Kenney, who has had many years of experience in the automobile industry in Michigan and elsewhere, has joined the force of the Hyatt Roller Bearing Company, as chief mechanical inspector. He comes direct from the Northway Motor and Manufacturing Company, where he acted as division superintendent. Previous to that connection he was with the King Motor Car Company, as factory superintendent. He has also been identified with the Lozier, Pierce-Arrow and Locomobile companies.

The Hartford Rubber Works, Hartford, Conn., has been very busy of late and the officials are now contemplating extensive enlargements to the plant and a decided increase in the working force. Definite plans have not yet been announced. The original product of the company consisted of bicycle tires, but for a number of years past automobile tires have been the principle output. The Hartford Rubber Works has been affiliated with the United States Tire Company for several years.

The McQuay-Norris Manufacturing Company, St. Louis, maker of Leak Proof Piston Rings, recently enter-

CAR ACCESSORIES AND EQUIPMENT.

UNION TWIST DRILLS.

High-Grade Drills Arranged in Metal Blocks According to Size and Also Decimal Equivalents.

Two drill sets of great value to any garage or repair shop are illustrated herewith. They are manufactured by the Union Twist Drill Company, Athol, Mass., which concern has attained a wide reputation for its production of high quality drills and cutters.

These sets are listed as the No. 18 and 19. The former consists of straight shank drills, which range by 64ths from 1/16 to 1/2 inches. No. 19 is composed of straight shank drills of wire gauge sizes, ranging from No. 1 to 60.

The blocks are made of metal and are claimed by the company to be practically indestructible. Each drill compartment is stamped with the size of the corresponding drill and also its decimal equivalent, thus affording a time saving reference for the mechanic. The tap drill sizes are also specified at the side of the block. A cen-



Union Twist Drill Carrying Blocks.

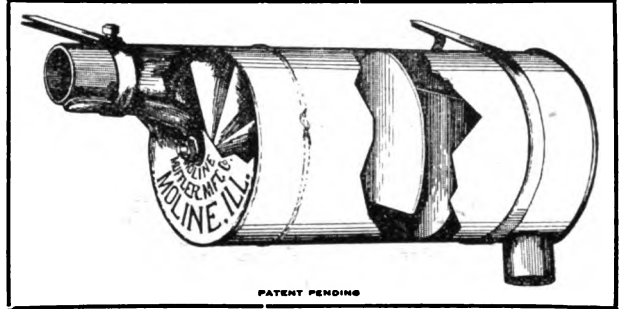
tre handle provides facility in handling the block, and it may be removed and screwed in the inside of the block when it is desired to store the equipment in the tool box. No. 18 set retails at \$12.80. No. 19 sells at \$10.95. Blocks are supplied at the additional charge of \$1.25 each. Detailed information on these and other Union products will be furnished on request.

POWER-ALL MUFFLER.

A Powerful Fan Draws the Burned Gases from the Engine and Forces Them Into the Air.

The power-all muffler, illustrated herewith and manufactured by the Moline Muffler Manufacturing Company, 403 15th street, Moline, Ill., is declared to increase the efficiency of any engine by quickly disposing of the burned gases and eliminating back pressure. This is accomplished by an exhaust fan which develops a powerful suction and draws the burned gases from the combustion chamber and then discharges them through the muffler. It is obvious that this arrangement will eliminate the

necessity of a cut out. Provision is made so that it cannot be affected by backfire. It is impossible for burned gases to remain in the muffler, as the fan continues to operate for some time after the motor has ceased. The



Moline Power-All Muffler.

manufacturer declares that this device will increase the mileage of a car from six to 10 miles to a gallon of gasoline, and that Ford cars will usually run 30 miles on one gallon of fuel. A notable feature is that this muffler will tone down the exhaust noise of a Ford car into a hum. Further particulars can be obtained from the company by mentioning this journal when writing.

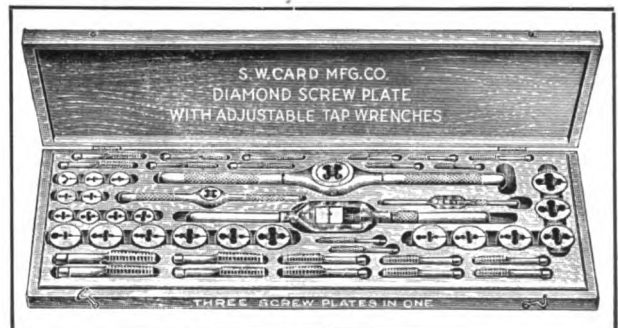
"How to Run a Lathe" is the title of a small book published by the South Bend Lathe Works, South Bend, Ind. The contents are valuable to anyone who operates a lathe, and it has been adopted as standard by many leading railroads of the country for their apprentices. A large technical university is also using these text books in the freshman year of machine shop practise.

CARD'S SCREW PLATES.

Three Screw Plates in One Packed in a Hard Wood Case Especially Adapted for Automobile Repair Work.

The S. W. Card Manufacturing Company, Mansfield, Mass., is marketing the No. 5 Diamond screw plate shown in the accompanying illustration. It is designed especially to meet the requirements of automobile repair work, and contains three screw plates in one, having an assortment of machine screws, U. S. standard or V standard, and S. A. E. standard sizes.

The equipment consists of 23 plug taps, 23 round, adjustable dies, two adjustable tap wrenches and two die stocks. Practically every piece of this set is needed every day in automobile repairing. Each part of this



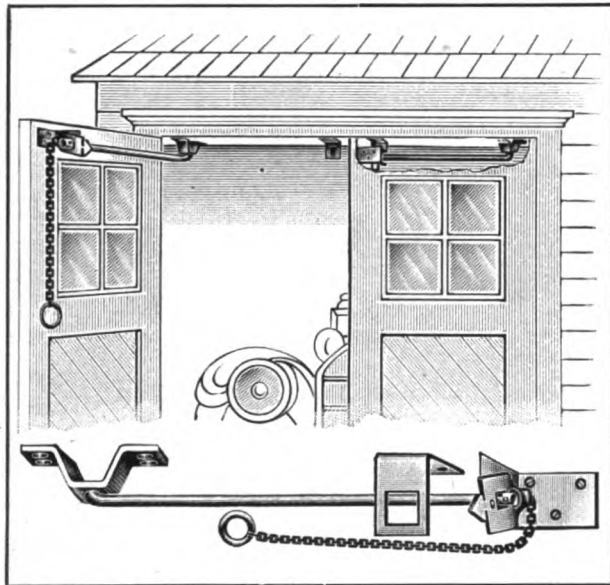
Card's Diamond Screw Plates and Wrenches.

assortment is guaranteed to be of the best material and workmanship. The complete outfit packed in a hard wood case retails at \$24.

SHELBY GARAGE DOOR HOLDER.

Attachment Automatically Holds the Garage Door in Any Desired Position Regardless of Conditions.

The Shelby Spring Hinge Company, Shelby, O., is manufacturing the Shelby garage door holder, illustrated herewith. It will automatically catch the door as it is swinging open to a right angle position or beyond. The door is held firmly in this position regardless of conditions, until released by a slight pull on the chain. It will



The Shelby Garage Door Holder.

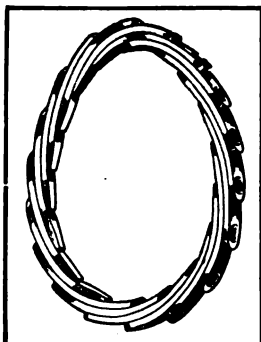
also lock the door as it is closed, the spear head of the latch entering the strike on top of the door frame. The attachment is strongly constructed of wrought steel, and all parts are heavily japanned. Installation is simple and it can be attached by anyone very quickly.

FLEXO LAMINATED "V" BELTS.

Endless Laminated "V" Shaped Belts Which May Be Adjusted to Any Size Without the Use of Special Tools.

The belt shown in the accompanying illustration is made by the Detroit Leather Works, East Lafayette boulevard and St. Antoine street, Detroit, Mich. It is termed the flexo laminated "V" shaped belt and it is made in sections which are cut from solid centre back belting hides and assembled with steel copper plated rivets. The belt is made endless by the use of machine screws and nuts and it may be readily lengthened or shortened without the use of special tools. As the wearing surface is on the sides, a great friction surface results.

These belts are made in both oak and chrome stock, in sizes ranging from $\frac{5}{8}$ of an inch to $1\frac{1}{2}$ inches in width. The oak stock sells according to size from $3\frac{1}{2}$ cents to $6\frac{1}{2}$ cents, while the chrome stock ranges from five to eight cents per lineal inch. The belts may be obtained in the desired length or in rolls of 50 feet each.



Flexo Laminated "V" Belts.

SCHOFIELD'S LIQUID AIR.

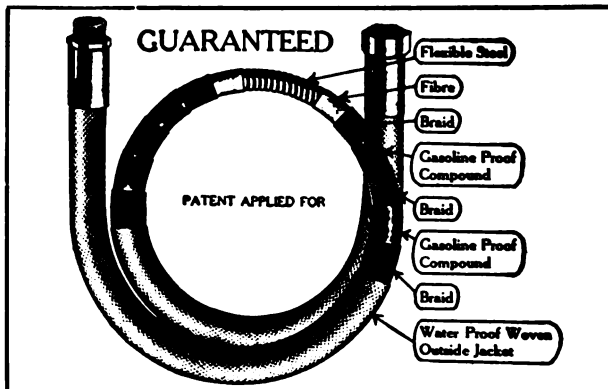
It Permanently and Automatically Stops All Punctures Up to and Including a 16-Penny Spike.

The Dan-Mar Corporation, 1790 Broadway, New York City, guarantees any tube treated with Schofield's liquid air, according to directions, against blow outs, punctures, rim cuts and all other conceivable injuries for a service period of 5000 miles. It is a fibrous compound in semi-liquid form, which is forced into the tube through the valve stem and occupies about six per cent. of the tube's space. When a puncture occurs, the air rushing to the break concentrates the compound at the weakened point. As it contains many fibres of varying length, the hole is easily plugged. The substance is guaranteed to permanently and automatically stop all punctures up to and including a 16-penny spike. It is free from offensive odors, will not deteriorate with age and is not affected by changes in temperature. It does not clog the valve or interfere with vulcanizing. If the liquid air fails to fulfill the above stipulations the company will refund the purchase price. The company also guarantees to replace any tube which can be shown by a written statement from the manufacturer to have been injured by the compound. Of course these guarantees only hold when the shoes and tubes are in good condition when treated.

**EVERLASTING GASOLINE HOSE.**

Flexible Guaranteed Gasoline Hose in Which No Rubber Is Used in Its Construction—Fits All Tanks and Pumps.

The Everlasting gasoline hose, manufactured by the Chicago Tubing and Braiding Company, 216-224 N. Clinton street, Chicago, Ill., has no rubber in its construction, and yet it is claimed to have the flexibility of rubber and the strength of steel. The core is formed of loosely wound steel, heavily jacketed. Seven different coverings are placed on the core, they being in the order named, fiber, braid, gasoline proof compound, braid, gasoline proof compound, braid and a water proof woven outside jacket. It is guaranteed not to leak or to



Everlasting Gasoline Hose.

scratch the car's finish. It is sold in any length and will fit any tank or pump. Complete information will be furnished on request when mention is made of this journal.

PRACTICAL MOTOR CAR REPAIRS.

ALL accessories of a car that are subject to wear can be greatly reduced. The life of the wiring, gas tubing, etc., can be increased at

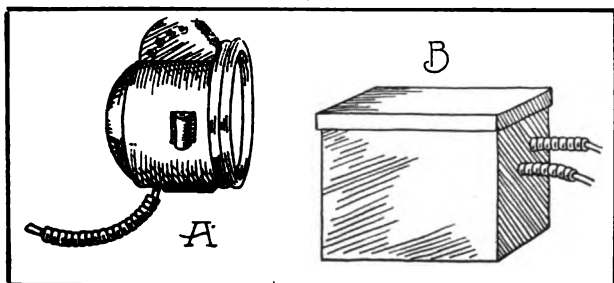


Fig. 100—A, Protecting Rubber Pipe with Flexible Metal Tube; B, Armoring Electric Cable at Battery Box.

slight expense and little trouble. Metallic flexible tubing is now marketed in various sizes and is inexpensive. If a small piece of this was placed over the rubber tubing leading to the gas lights, as shown in Fig. 109 A, the rubber would not be subject to the weather and could not kink, a trouble frequently met with. At Fig. 109 B is shown a method of preserving the insulation on the wires leading from the battery. Pieces of tubing are inserted in holes in the battery box and the wires passed through them.

REPAIR OF TIE ROD.

When a machine has been used several years the tie rod between the front wheels will become loose from wear. This play is generally in the threaded parts and operation may be dangerous. A simple repair can be made by drilling through the yoke and rod and inserting a taper pin. This is not permanent, however, as the parts are subject to great strain and the pin will soon wear. If the parts were brazed or welded together the aligning adjustment would be lost. A better repair for this condition is shown in Fig. 110. Remove the rod from the yoke and heat it to a high temperature. A mandrel a trifle larger diameter than the hole should be driven inside, as shown in Fig. 110 C. This will materially expand the metal. Should the outside diameter be too great, the

rod can be placed in a lathe and the threads recut. The complete assembly is shown at D.

PISTON RING COMPRESSOR.

The piston ring compressor shown in Fig. 110 B is easily made and quickly applied. It consists of a suitable length of band iron about $\frac{1}{8}$ -inch in thickness and $\frac{1}{2}$ -inch in width. It should then be placed in a vise and the ends bent as shown. Assuming that the compressor is to be used on a piston $4\frac{1}{4}$ inches diameter, a piece of metal about 16 inches in length would form the ring. When fully closed the ring should measure slightly less than $4\frac{1}{4}$ inches diameter, so that when clamped it will firmly hold the piston ring in its channel.

LIGHTING THE WASHSTAND.

Lights of the overhead type for garage washstand are not always satisfactory, for they do not illuminate the wheels and sides of the machine. At Fig. 110 A is shown a simple home-made lighting stand. Secure a length of piping to a wood base and then drill and tap a hole near the top for a small thumb screw. Select a rod which corresponds in diameter to the hole in the pipe. Insert as shown. Now obtain a reflector of sufficient size to project the light of a group of four lamps. Strips of metal should be riveted to the sides of the reflector and holes drilled through the ends and top of the telescoping rod. Attachment can then be made to the stand by a thumb screw and nut. This arrangement will also be found to be useful when making repairs on the machine at night.

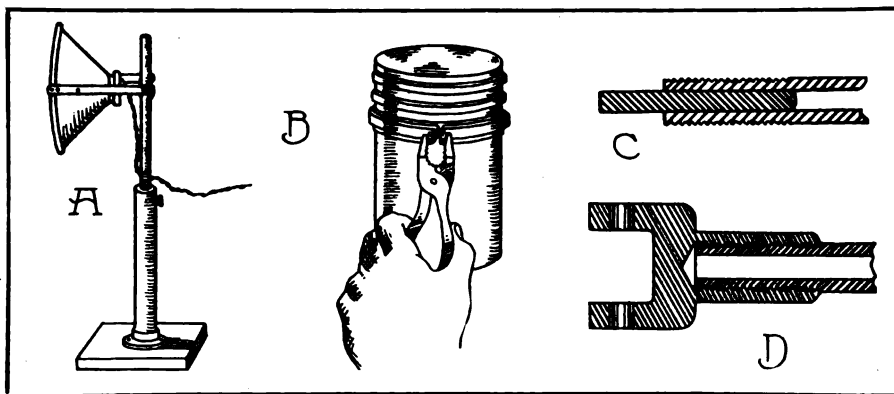


Fig. 110—A, Home-Made Washstand Light; B, Handy Piston Ring Compressor; C, Expanding Tie Rod Tube; D, Repaired Tie Rod.

REAR AXLE HOUSING RELEASE.

When the felt packing washers or gaskets are worn grease will work out of axle housings and

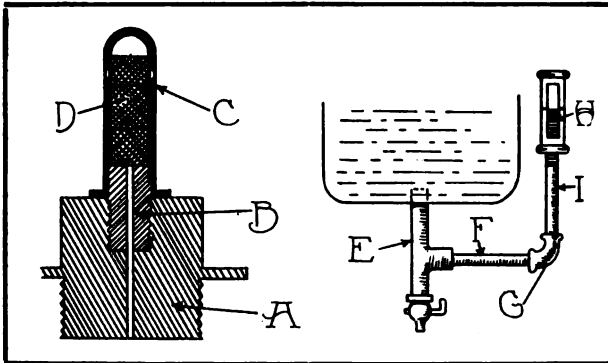


Fig. 111—A, Device for Reducing Pressure in Differential Housing; E, Oil Gauge for Old Type Motor Crank Cases.

on to the rear wheels. But grease on the wheels is not always a result of the wear or hardening of the felt washers. Experiments have proven that expansion of air in the differential housing may cause sufficient pressure to force lubricant past the washers. Such leakage can be stopped by attaching a vent to the filler cap, as shown in Fig. 111 A. This is only advisable when the cap is located on one side of the housing and not in the centre, directly over the ring gear. Obtain an old valve stem, as shown at B, and cut off a piece of about one inch in length. Next drill and tap the cap so as to admit the stem. It is advisable to lightly solder the stem to the cap so that it cannot work loose and fall into the housing. Obtain an ordinary dust cap and drill three small holes at the top as at C and then insert a fine brass screen, as shown at D, and screw the cap tightly on the valve stem. The screen will prevent dirt or foreign matter entering the housing, but does permit equalization of the air pressure.

HOME-MADE ENGINE OIL GAUGE.

Engines of earlier designs are not always equipped with indicators or gauges to show the quantity of oil in the crank case or reservoirs. An easily constructed indicator is shown in Fig. 111. Usually the case will have a petcock at the base for draining it and this should be removed and a T fitted in the opening as at E. Screw a short pipe into the T as at F and at the free end fit an elbow, G. A small glass gauge, H, can be obtained at any hardware store and this should be attached to the elbow by a short pipe, I.

A short piece should be tried at first and oil

placed into the crank case until the engine emits a smoky exhaust. The oil should then be gradually drained until the smoking ceases. This is the correct oil level. A pipe should now be fitted that is of the proper length to allow the oil to appear about an inch from the top of the gauge. The point can be marked on the gauge and the driver can always determine the quantity of lubricant that is in the crank case. A petcock can be fitted to the free end of the T for draining purposes.

PRACTICAL PRIMING DEVICE.

In cold weather starting can be made easier by priming the motor. This is inconvenient for the driver when it necessitates raising the hood. An easily made priming device which will better convenience the driver is shown at Fig. 112. Run a length of annealed copper tubing from the top of the intake manifold to the dash. The manifold should be drilled and tapped and a connector fitted as shown. A small coil is then made in the tubing so as to prevent breakage from vibration and the free end carried through the dash. An elbow and priming cock is then fitted as shown. Of course the priming cock on the dash should be higher than the end of the tubing which enters the manifold, as the flow from the tank is by gravity. The device is especially useful, as the cup may be slightly opened to admit auxiliary air to the mixture. Water can also be fed to the motor in this manner for removing the carbon from the cylinders.

An easily made preparation for polishing unpainted steel parts of the car is to mix a small quantity of very fine emery with soap paste. This compound will remove rust without scratching the surface.

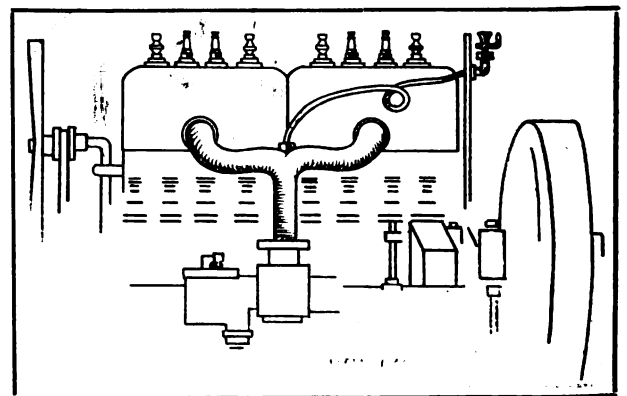


Fig. 112—Method of Priming an Engine from the Dash.

SUGGESTIONS FOR THE FORD CAR OWNER.

The Frame and Its Suspension, the Steering Knuckles and the Linkage by Which the Vehicle Is Turned, and the Flexible Mounting of the Axles.

The 36th article dealing with the construction, operation, maintenance, care and repair of the model T Ford chassis is devoted to a consideration of the frame and its suspension, the steering knuckles and the linkage by which the vehicle is turned, and the manner of coupling the front and rear axles flexibly with the frame.

THOSE who have examined the plan views of the model T Ford chassis realize that the frame is a rectangular construction of pressed vanadium steel channel section, that has primarily two side and two end members. In this the engine is mounted on the two side members and the front cross member, but this is not a rigid mounting, so that the "weave" or distortion of the frame will not cause strain upon the engine.

The front and the rear ends (the members themselves) are mounted on the front and rear transverse springs, which in turn are carried on what are known as the spring perches. The torque tube carrying the main driving shaft extends from the centre of the rear axle housing forward, where it unites with the two radius rods from either end of the rear axle. But the rear axle is free to have a vertical movement from the deflection or reflexion of the rear spring, the torque tube being free for movement within the housing at the rear end of the engine case that carries the globe enclosing the main driving shaft universal joint. The fact has also been pointed out that this is in effect a three-point suspension of the body on the frame.

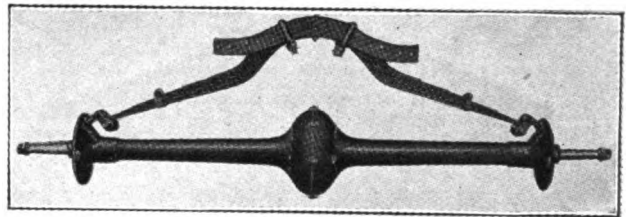
The stresses of braking and traction are all taken by the radius rods and the torque tube, so that there are no abnormal strains upon the rear spring. This spring is a semi-elliptic type that is peculiar unto the Ford chassis, for it has a secondary arch in the centre, which is primarily intended to afford clearance for the housing of the differential gearset, and which, because of the form, insures a very substantial seating for the rear end member of the frame.

The Front Axle Construction.

The forward spring is a conventional semi-elliptic type that, as does the rear spring, parallels the axle. To this spring the front end member of the chassis frame is securely bolted. The normal movement of the front spring from deflection and reflexion is in a vertical plane, and this depends upon the load and the condition of the

road surface over which the machine is driven. As the front axle carries the wheels and there is thrust upon it from the tractive effort of the rear wheels, the relation of this axle and spring must be preserved.

This is done by the use of a front radius rod construction. This is in form two sides of a right angle, there being a ball at the apex of the angle, with the ends of the legs fitted for attachment to the front axle. The ball of the radius rod is mounted in a socket that is formed by bolting a cover over a socket attached to the flywheel housing. The ball and socket joint will permit the vertical movement of the front axle without resistance other than that of the spring, and at the same time there is no rigidity of construction so far as the axle ends are concerned. There is positive relationship of the axle and spring with reference to the other members of the chassis,



The Rear Axle and Spring, Showing the Manner of Suspension from the Perches and the Rear Cross Member of the Frame.

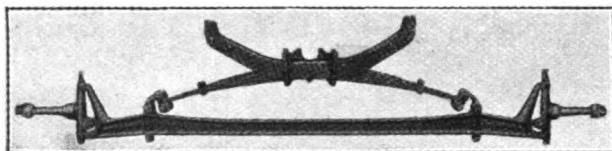
and there is a very large degree of flexibility because the attachment of the front wheels is at three points and the body is carried so that it is protected so far as is possible against strains.

Construction of the Front Axle.

The front axle of the Ford chassis is drop forged from vanadium steel and is an I section, this insuring maximum strength with minimum weight. This follows conventional practise in construction, having yoke ends in which the wheel spindles are mounted on pivots. The spindles each have an arm that extends backward from the upright part of the knuckle, which is connected by a tie rod, so that when this rod is pushed or drawn by the steering gear the wheels are turned as desired.

The manner in which the steering knuckles

are constructed does not differ from the general form that is approved for motor vehicles, but while the knuckles may be swung readily on the



The Front Axle with the Spring Carried on the Perches and Supporting the Front Cross Frame Member.

pivots, the movement of the wheels is limited to an angle of 30 degrees in either direction, this being the turning radius of the chassis that has the common approval of automobile engineers. The pivots for the knuckles are in effect bolts that extend from the top to the bottom members of the yokes of the axles, and the knuckles are machined so that there are top and bottom bushings in the bores, which insure positive bearing at either end of the bolts, and the space between the bushings serves as a reservoir for the lubricant that is supplied to each knuckle.

How the Front Wheels Are Set.

The knuckles are fitted within the yokes of the axle at a very slight angle from the vertical, so that when the machine is assembled there will be approximately three inches less pace between the centres of the tires as they rest on the ground than between the centres of the tires at the top, or 180 degrees from the points of contact with the road surface. This variance from a true vertical line is $\frac{3}{4}$ inch on either side of the centre of the wheel spindle, or a total of $1\frac{1}{2}$ inches for each wheel. The purpose of this is to obtain easier steering and is typical of all automobile vehicles, although there may be some difference in the degree of the angle.

For the purpose of determining the angularity of wheel inclination, the measurement between the tire centres in contact with the ground and at points on the circumference of the tires or rims 180 degrees apart, or diametrically opposite, are taken arbitrarily rather than the wheel centres or the axle centres. There is hardly need to emphasize that while the wheels are given this set to obtain a definite result that any variance of the wheels from their relationship to each other would cause undue wear upon the tires and the destruction would be in ratio to the difference between them.

Strength Obtained with Light Weight.

The shape of the front axle is such that the greatest width of the I section is at the points where the spring perches, so-called, are located.

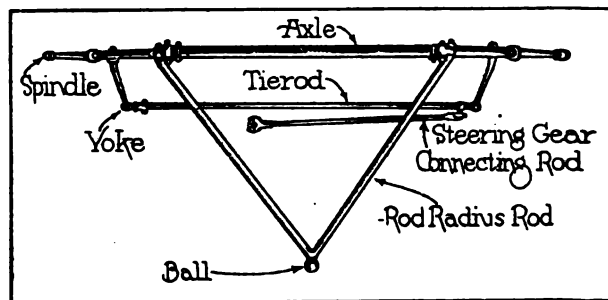
for these perches are steel drop forgings that are fitted into sockets that extend through the axle section from top to bottom and are secured by nuts. The axle sections where the perch sockets are located are slightly enlarged, so that there is greater strength at these points, both from the increased depth as well as from the widening of the section. The purpose of this design is to minimize weight without sacrifice of strength, and to have construction that will make for easy and comparatively inexpensive renewal of wearing parts whenever occasion shall require.

In designs where the springs are placed at right angles with the axle the seats are usually forged integral with the I section, or if of tubular design the seats are fitted on in the form of sleeves or brackets. These seats are essential to afford substantial bases for the springs, for the strain upon them from the driving momentum of the vehicle, as well as the side pressure from steering, is very great. With the spring that parallels the vehicle frame there is longitudinal endurance of the driving stresses, which necessarily include those from contact with road obstructions as well as from the propulsive effort, but there is comparatively little resistance of the spring to the side pressure upon it.

Design Protects Against End Thrust.

When minimum weight is required the spring that will weigh the least and yet serve all purposes is by far the better. The transverse spring of the Ford chassis is probably the best that could be designed for the purposes for which it is used, as, with shackling at either end it has a yielding resistance to all side pressure, because the resiliency of the spring itself effectively cushions the end thrust upon the wheels and axle spindles, and the shackles afford an elastic suspension that is more effectual in its protection than if the springs were rigidly mounted. Not only this, the use of a lighter spring is practical.

By shackling the spring the ends of the axle will yield through the spring deflexion quite as



The Front Axle, Top View, Assembled with the Tie-Rod and the Linkage That Couples the Steering Gear with the Wheels.

freely as with any other form of construction, and by the use of the radius rod that, with the axle, forms a triangle, there is always a uniform driving influence upon the axle and the wheels. The formation of the axle and the use of the spring perches simplifies restoration in the event of wear. The spring perches serve two purposes. These have straight sections that extend through the sockets in the axle, and the upper portions have two eyes or holes machined in them. When the perches are fitted these eyes are transverse of the axle, so that the ends of the radius rods are secured in the lower two, and the upper two carry the upper pins or bolts of the spring hangers. These hangers are shaped as right angles, one arm being the spring bolt and the other the shackle link, the link arm being flattened and having an eye the diameter of the bolt arm.

The bolt arms of two of these pieces are inserted in the spring eye and the eye of the spring perch from opposite sides, and the link eyes fitted on the bolts, forming a shackle that is a rigid square link when the nuts are screwed on the bolts and secured. This hanger, however, will afford perfect freedom of movement for the spring and it has the quality of being extremely economical of construction as well as being very enduring. These hangers can be replaced when worn at comparatively small cost, and as the spring eyes are bushed there is no destructive wear for which compensation is not provided.

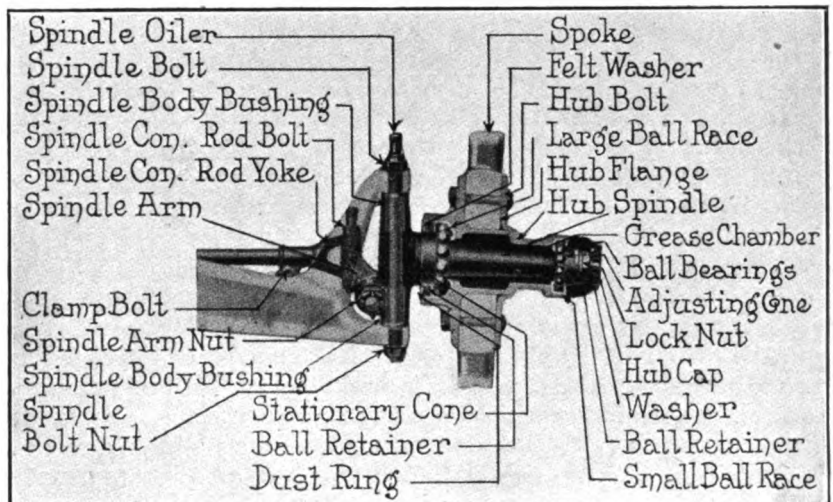
The spring perches of the front axle are so shaped that the hangers carry the spring eyes below the eyes of the perches, this suspension insuring that the movement of the spring through deflection or reflexion will be comparatively small and yet perfectly free. Obviously, the front spring is carried directly above the axle, so there is no side pressure upon it. The centre of the arch of the spring is secured to the curved front frame member by two U shape irons that have flat yokes across the ends secured by nuts. This frame member is a channel section and there is a fitting between the yokes that prevents them slipping toward the centre and insures against loosening of the spring.

The mounting of the rear spring is by similar shackle or hanger links that are fitted to the

spring eyes and eyes of the perches, the perches being curved brackets that are bolted to the flanges at the outer ends of the rear axle. The suspension is practically the same, the spring eyes being lower than the eyes of the perches, and there is identical yielding resistance of the transverse spring to end thrust upon the axle.

As the rear spring is secured to the upward curved rear frame member by clips and yokes fast in the secondary arch, there is, because of the form of the spring, a considerable degree of shock absorption, but with standard spring size there is no variance for either roadster or touring car. To obtain the fullest efficiency of the spring with a touring body, at least two passengers should be carried. This load dampens the spring effectually and prevents too free action.

If the chassis frame were supported on four



The Front Wheel in Cross Section, Showing the Construction and the Relations of the Different Parts, and the Connection of the Steering Linkage with the Knuckles.

points this would carry the engine rigidly, but there would be free vertical movement of the springs, while the axles would be maintained in relationship by the torque tube and the front radius rods. When the axles are supported by the wheels the weight of the frame and engine and body equipment will sufficiently depress the springs so that the entire structure is in every way substantial. That is, the frame connections will maintain the springs upright and free to function, and the driving impulse will be transmitted through the torque tube, the engine case and the radius rods with comparatively little stress upon the frame.

The shafts by which the rear wheels are driven are mounted on roller bearings, one set carrying the differential gearset, and the other,

at the ends of the axle housing, carrying the shafts to which the wheels are keyed. The rear wheels are built with comparatively small hubs, which are taper bored, so that there is a taper end to each shaft that is keyed into each hub and further secured by a lock nut and a cotter pin. These wheels carry the brake drums, which extend over the edges of the flanges that support the internal expanding brake shoes. The brakes are generally cast iron shoes and these are expanded by cams that are turned by the lever arms mounted in the brake flanges.

Emergency Brake Connections.

The brake rods are carried forward through guides that are attached to the radius rods and connected with the controller shaft, so-called, which is "rocked" by the hand lever operating the emergency brake. This shaft is located transversely across the chassis frame and it is arched in the centre to clear the universal joint of the driving shaft, beneath which it is placed. This shaft has two small levers near the ends, to which the pull rods, that are coupled to the lever arms of the brake shafts, are connected. The controller shaft is so connected with the clutch pedal that when the hand lever is in an upright position the clutch is disengaged, and when drawn backward from that position the brake is applied. Obviously, the backward movement of the lever causes a forward movement of the levers of the controller shaft, they in turn actuating the levers and the cams of the brake shafts. And this interconnection prevents any operation of the clutch until the lever is moved forward or the clutch pedal is pressed with the foot. One will note that this brake connection is flexible.

The Construction of the Wheels.

The wheels are what is known as artillery type construction—that is, they have short, heavy spokes and wide rims, with cast metal hubs and flange plates. The spokes are secured in the hubs between the flange plates by a series of bolts, and the rims or fellos are the foundation for carrying the steel rims or channels on which the tires are mounted. The wheels are such diameter that on them may be installed pneumatic tires that are 30 inches external diameter and three inches cross section for the forward tires and $3\frac{1}{2}$ inches cross section for the rear tires.

The rear wheels, because the hubs are keyed to the driving shafts, are extremely simple, but the hubs of the forward wheels are larger in internal diameter because they must have space for the mounting of the annular ball bearings on which the wheels turn. These bearings are what is known as the cup and cone type, there being

cups or races pressed into the hubs of the wheels, while the cones are of two forms. The larger or inside cone is stationary—that is, when the wheel is placed on the spindle it is forced against this cone, but the smaller or outside cone is adjustable, so that any desired relation can be obtained, and then the cone is secured with a lock nut and a cotter. There is a felt washer behind the stationary cone, which prevents grease working out on to the wheel hub and the axle. The space between the axle spindle and the walls of the hub chamber may be filled with grease for lubrication of the bearings. The outer end of the hub is covered with a cap that is screwed on and which prevents abrasives and water from reaching the bearings, and serves to retain the grease.

The two arms that are fitted to the pivots of the steering knuckles extend backward and they are connected by a rod that has a yoke at either end, that is known as the spindle connecting rod, but which is usually referred to in motor vehicle construction as the tie rod. The left end of the rod is threaded, so that there is adjustment for length, and by turning the yoke at this end it may be shortened to compensate for wear. Near the right end there is a hole drilled and at this point a yoke end of another rod is bolted. This rod is known as the drag link and it is coupled to the lever arm at the lower end of the steering column by a cap that is bolted on and which forms a ball and socket joint. The turning of the steering wheel will swing the lever from right to left, or vice versa, and this will carry the drag link in either direction, and moving the tie rod so that the arms will move the wheel spindles on the pivots. This is a simplified form of construction which serves every required purpose and which will allow such compensation for wear as may be necessary to maintain the desired relations.

(To Be Continued.)

JOY ELECTED BY AERO CLUB.

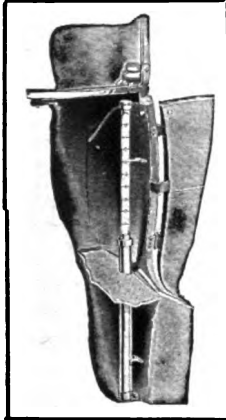
Henry B. Joy, president of the Packard Motor Car Company, Detroit, has been elected to the board of governors of the Aero Club of America. His acceptance of the offer is in line with his other activities for preparedness. The Aero club is seeking to convince the government that a large increase in the American air fleets is necessary to keep the United States abreast of the European nations. It is reported that experiments are now being conducted under Mr. Joy's supervision to produce an aeroplane motor of the high-speed, multi-cylinder type.

FORD CAR ACCESSORIES AND EQUIPMENT.

"FOXY" DASH GASOLINE GAUGE.

Gasoline Gauge to Be Attached to Dash of Ford Car Having Supply Tank Under Seat.

Nothing is more provoking than to run short of gasoline when on the road. This predicament can be prevented on the Ford car by installing the "Foxy" dash gasoline gauge illustrated herewith. It is manufactured by the Fox Accessories Company, 47-51 Raymond street, Brooklyn, N. Y. This attachment will show at a glance the amount of fuel in the tank at all times. The gauge fastens to the dash of the car by four screws, the bottom resting about $\frac{1}{4}$ inch from the frame of the chassis. Attachment to the car is simple. Shut off the fuel at the tank in the usual manner and then remove the drain cock at the bottom of the sediment cup, and in its place screw in the brass tee, which is supplied. The pipe furnished should then be connected to the tee and also to the bottom of the gauge. The drain cock fits the bottom of the tee. The only work required on the car is to cut a small hole through the foot board to admit the gauge and to slightly enlarge the vent in the cap on the gasoline tank. Absolute guaranty is given as to the accuracy of the gauge. It is durable and being nickel plated is very attractive. This arrangement is useful for determining the exact quantity of fuel received from filling stations. It also eliminates the danger of explosion by attempting to measure the gasoline at night by a rule and lighted match. When ordering the gauge it should be stated whether a cowl or straight dashboard is used. The price complete with fittings is \$3.50.



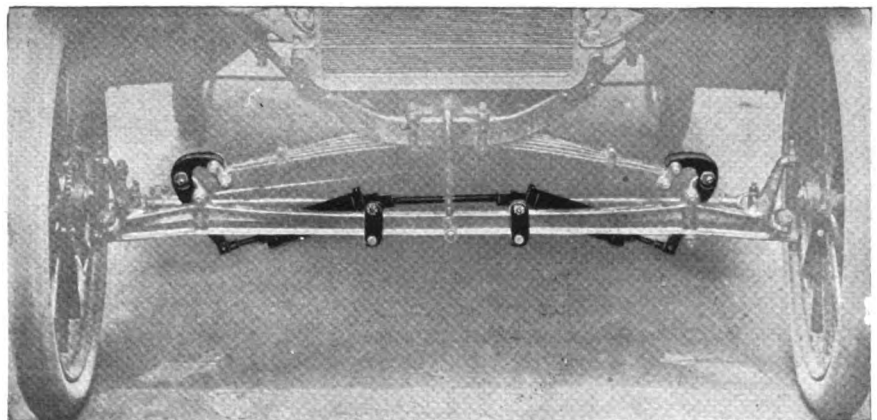
"Foxy" Dash Gasoline Gauge.

JENNEY REBOUND NEUTRALIZER.

Rebound of Ford Car Springs Cushioned by the Principle of Oil Pressure Retardation.

The Jenney Shock Absorber Company, 535 North Capitol boulevard, Indianapolis, Ind., is manufacturing the Jenney rebound neutralizer and supplemental spring for Ford cars, shown in the illustration. Principle involved is somewhat of a departure from previous types in that retarding motion is produced by oil pressure. The device is equipped with a compound lever, the upper end of which carries the car spring. The lower end of the lever actuates a piston rod working in a cylinder, which is attached nearly horizontal to the car axle. The downward movement of the car causes the piston to be drawn outward. As the cylinder is filled with oil the lubricant freely passes through small holes in the piston. The downward motion cannot be rapid, however, as a coil spring controls this action.

The main feature of the neutralizer is its method of preventing the rebound. As the car spring starts upward the piston is forced back against the oil. This movement forces a washer over the holes in the piston, causing the only escape for the oil to be the small space between the piston and the cylinder.

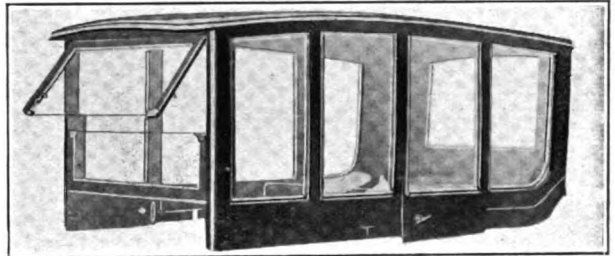


Jenney Rebound Neutralizer and Supplemental Spring Installed on a Ford Car.

TAPCO LIMOUSINE.

Limousine Top Which Replaces Ford Windshield and Top and Adds but 75 Pounds to Car's Weight.

The limousine top for Ford cars shown in the accompanying illustration is marketed by the Auto Parts Company, 737-739 West Jackson boulevard, Chicago, Ill. It is a flush fitting top, which fits snugly on the body of the Ford car and converts it into a practical and substantial limousine. The frame work is of the best kiln dried lumber and reinforced at the corners. The ex-



The Tapco Limousine Top for Ford Cars.

terior is highly finished and the interior is upholstered in the best of leather. Ample ventilation and protection from the weather is provided by the adjustable windshield. There are also four glass windows on each side and one in the rear that can be lowered when desired. The interior is also fitted with a dome light just over the rear seat, and it is wired ready for immediate attachment to a battery. When this top is attached to the Ford body the doors of each open as a unit. Installation can be made on any 1913, 1914, 1915 cars, as all necessary parts are furnished. When the present Ford windshield and top are removed the limousine top increases the total weight by only 75 pounds. The retail price of the Tapco top is \$110.

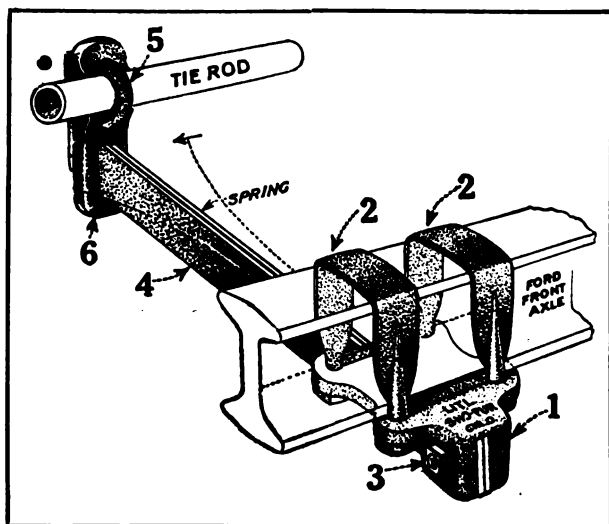
LITL SHO-FUR.

Attachment Which Holds the Front Wheels of a Ford Car in a Straightaway Direction.

The litl sho-fur, manufactured by the White Manu-

facturing Company, 713-715 Main street, Cincinnati, O., is designed to serve the same purpose on the Ford car as does the irreversible steering gear on higher priced cars.

It attaches to the front axle by two strap bolts, while an eye clamps the tie rod. A two-leaf spring, of specially tempered spring steel, is the medium which con-



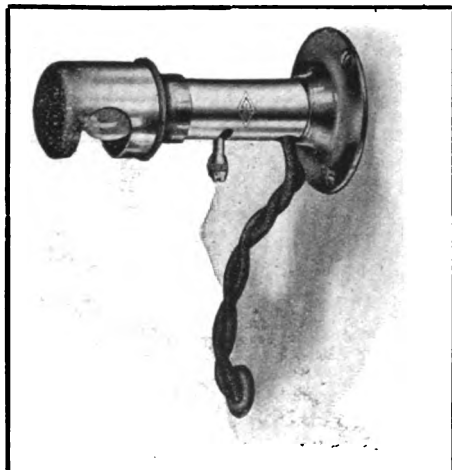
The Little Sho-Fur Installed on Tie Rod and Axle.

trols the action of the wheels. As the spring is held stationary at one end to the axle, should the tie rod be moved to either side the tendency of the spring would be to return the tie rod to its original position. This arrangement insures against accidents due to the deflection of the front wheels by small stones and ruts. It can be attached quickly to any model T Ford, as no machine work is necessary. It retails at \$3.

CULVER-STEARN'S DASH LIGHT.

Model J Speedometer Light Is Designed for Use on the Dash of Ford Cars and Lists at \$1.

A speedometer light for the dash of a Ford car which can be operated separately from the rest of the lighting system by the use of two dry cells, is made by the Culver-Stearns Manufacturing Company of Worcester, Mass., and Detroit, Mich. It is built of brass and heavily nickelled, and gives a clear, steady light upon the instrument board. It is fitted with a self contained switch. The entire Culver-Stearns line is trade marked and many of the products have been approved by engineers of the leading makers.



Culver-Stearns Model J Speedometer Light for Fords.

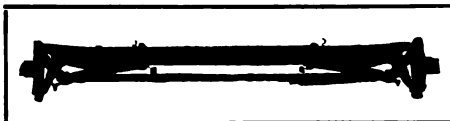
the cars on which C-S speedometer lights are used are Overland, Studebaker, Case, Saxon, Dodge, Davis, Allen, Locomobile, Mercer, Haynes, Westcott, Jackson, Empire, Oldsmobile and Chandler. In addition to speedometer lights the line includes lamps, fittings, dash, gauge and trouble lamps and windshield searchlights.

AUTOMATIC STEERING DEVICE.

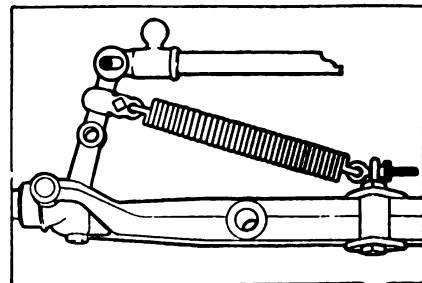
Springs Which Attach to Ford Cars and Produce Effect of Irreversible Steering Gear.

The Anderson automatic steering device, illustrated herewith, and manufactured by the Anderson Game Company, Anderson, Ind., is declared to be an anti-rattler, a steering gear shock absorber, an automatic steerer, a tire saver and a lost motion eliminator. It consists of a spring which is secured to the front axle and to the steering knuckle. The equipment consists of two such springs, one attached to either steering knuckle. The brackets that hold the springs to the front axle have a micrometer adjustment, which permits perfect alignment of the front wheels by finely equalizing the spring tension. This arrangement draws the knuckles and the bolts firmly against the ends of the tie rod, thereby eliminating all wear and lost motion.

As the front axle is angular in shape at the point where the brackets attach, even a sledge hammer blow could not change their positions. By preventing the vibration of the front wheels, steering is greatly assisted and tire wear reduced to the minimum. The wheels are always held in a straight line and should they be turned as when driving around curve, they will automatically centre by releasing the grip on the steering wheel. This equipment will take up the wear and lost motion on a used car, thus eliminating the noise, and will also prevent the same on a new car. The price of a pair is \$2.75. Inquiries should be addressed to the Anderson Game Company, and the letters should contain mention of this magazine.



Anderson Automatic Steering Device in Position.



Anderson Automatic Steering Device.

COWL DASH FOR FORD CARS.

Cowl Designed to Fit Under Windshield of 1914 Ford Cars and Greatly Improve General Appearance of the Same.

The appearance of the 1914 Ford roadster and touring cars can be greatly improved by attaching the cowl illustrated herewith. It is made by the Ideal Sheet Metal Works, 2807-2809 Michigan Avenue, Chicago, Ill., and is designed to fit under the present windshield. The two lugs at the side also



The Ideal Cowl Dash for 1914 Ford Cars.

fasten to the windshield supports that connect with the body on the same bolts. The cowl is made of the best material obtainable and is rolled on the edge with heavy wire. It is neat in appearance and is enamelled black. The manufacturer declares that it can be attached to a car in less than 10 minutes. The list price is \$4.50.

The manufacturer will welcome inquiries about this heater, as well as the other quality products made by the Ideal Sheet Metal Company.

MOTOR CAR BEATS RAILROAD TRAIN.

STOCK pleasure car highway speed records were lowered by A. E. Higgins, of Buffalo, N. Y., on Nov. 7, when he drove a Cole eight-cylinder from Buffalo to Geneva, N. Y., a distance of 107 miles, at an average speed of 55.8 miles an hour for the entire trip. He beat out the Black Diamond express, the crack train of the Lackawanna railroad, by 14 minutes. The trip included two involuntary stops and a detour that consumed considerable time.

The race was announced several days before it took place and people in the towns along the route were out to see the car go by. Motion picture companies had operators on hand to photograph both the car and the train as they passed. The car and the train left Buffalo simultaneously. Only one passenger rode in the car besides the driver, Mr. Higgins having to depend largely on the car's natural balance to stick to the road. A tire blew out while the car was 40 miles from Buffalo and two minutes were lost in putting on a new one. But the car's lead was so great that the train did not catch up. Again at Avon a switch engine with a freight car stopped directly across the track and a quick stop had to be made to prevent a collision. A little further on a six-mile detour had to be made to avoid a stretch of road that was being repaired.

The car travelled 107 miles in making the trip, while the train went only 102 miles. Owing to the delays, Mr. Higgins has made arrangements to repeat the test at a time when a complete right of way can be secured. His friends are so certain the car can better its previous record that they have posted a \$500 forfeit that he will do the run again in one hour and 40 minutes. To do this he will have to average 60.6 miles per hour. On a much shorter run out of Buffalo some time ago the Cole eight beat out the Empire State express.

PACKARD TWIN-SIXES SHIPPED.

Packard Twin-Six cars are being shipped in increasing quantities from the factory in Detroit. The "1-35," which is the larger of the two models in point of wheelbase and body dimensions, made its appearance in the regular shipments from the factory.

The wheelbase is 135 inches, as compared to 125 for the 1-25 model. The production of finished cars is now said to be reaching normal vol-

ume at the factory. Since the cars have been on the road demand for them has increased very rapidly and it now seems to be necessary to operate the enlarged plant at top speed all winter in order to dispose of the \$10,000,000 accumulation of orders and provide additional cars for delivery in the spring.

OLDS CUTS PRICE OF ITS EIGHT.

An incident in the new wave of price reductions on motor cars was the sudden announcement of the Olds Motor Works that its eight-cylinder car, for which thousands of orders had been booked at \$1295, would be sold at \$1195. This announcement was made after the first shipments had left the factory and were on their way to dealers and while advertisements carrying the \$1295 price were in type in publication offices.

It was brought about by the discovery that the flood of orders for the car and the quantity in which they would be built had made production at the lower price possible. The company has been gradually extending its plants and increasing its capacity. It has behind it the immense purchasing power of the General Motors group of companies.

NEW CHALMERS IS ANNOUNCED.

When nearly 600 Chalmers dealers assembled at the annual sales convention of the company at the Detroit plant recently, a new model of the Chalmers six-cylinder, 30-horsepower car was announced. It is to sell for \$1050, the lowest price at which a Chalmers has so far been offered to the public.

In the first 40 minutes of the convention the dealers signed up for their allotments and \$22,000,000 worth of cars were disposed of in that short time—a new sales record according to Paul Smith, vice president.

A great parade was held from the factory through the city, in which the dealers rode in 300 of the new models. It is very unusual that a company should have so many cars of a new type finished before any announcement of them is made. Many city officials of Detroit took part in the parade, which was headed by a band, a platoon of police and a motorcycle police squad.

The gathering was addressed by Hugh Chalmers, C. A. Pfeffer and Paul Smith.

PRACTICAL FACTS FOR NEW CAR OWNERS.

Elementary Instructions in the Economical Operations, Maintenance, Adjustment and Repair of the New Car—Answers to Inquiries.

TO THOROUGHLY understand the underlying principles of the various makes of carburetors, the reader should have an understanding of the fundamentals of general carburetion. They are simple and can be easily followed in the sketches accompanying this article.

The gasoline flows from the storage tank into float chamber of the carburetor through the opening shown in Fig. 1. As the quantity of gasoline increases the float is raised and it in turn raises the outer ends of the toggle levers. These levers are on pivots and are attached to the needle, or shut off valve, which as the level of

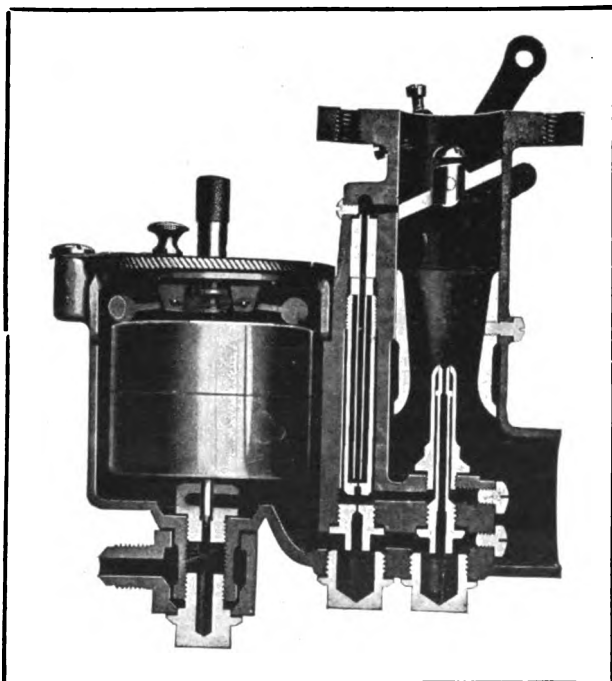


Fig. 1—Sectional View of a Generally Used Carburetor.

gasoline in the float chamber becomes higher is forced gradually into its seat. When a predetermined level of fuel is reached the needle is seated firmly and the flow into the carburetor is checked.

From the float chamber the gasoline passes through a narrow channel and thence to the spray nozzle. The action of the float and the level of gasoline around the spray nozzle are closely related. When the fuel reaches the mouth of the nozzle the float should be at its highest

position and the needle should be seated so tightly as to prevent admission of any more fuel at that time.

Setting the Gasoline Level.

One frequently hears of a repairman "setting the gasoline level," which means that he adjusts the needle valve so that it will shut off the supply just before the gasoline reaches the top opening of the spray nozzle.

The next step is the passage of the fuel into the mixing chamber and thence into the cylinder through the intake valve. The downward thrust of the piston creates a suction just as the intake valve opens. This draws in air to circulate around the spray nozzle, and as the air passes the mouth of the nozzle it sucks the gasoline and converts it into a fine spray. Gasoline is very volatile and is soon changed from liquid to gas, and consequently only gas and no liquid is taken into the combustion chamber of the cylinder. Should the air fail to completely vaporize the gasoline spray, the liquid would be immediately vaporized by the intense heat of the cylinders.

In order to provide for vacuum that will satisfactorily draw in the proper amount of air at a speed great enough to vaporize the fuel, the designers of carburetors have adapted the venturi tube, which is built around the spray nozzle. It is based upon the principle that as the size of an outlet is decreased the flow is proportionately increased in rapidity at the constricted part. After passing the spray nozzle proper, the air is forced through the smaller opening of the venturi at a much greater speed. From here the gasoline spray passes into the mixing chamber and thence to the cylinder.

Function of the Butterfly Valve.

The flow through the mixing chamber is controlled by a butterfly valve, in order to suit the volume to the variations of engine speeds. This valve is circular and is located in the chamber above the spray nozzle. It is usually of light construction and held on its seat by spring tension, which is adjustable by the nuts generally referred to as the adjusting nuts.

As the speed of the engine becomes higher a larger quantity of air is required for proper mixing of the fuel. This extra supply is generally

Environment

is an indication of quality, a criterion of standing. Refined judgments seek refined surroundings and demand refinement in all purchases.

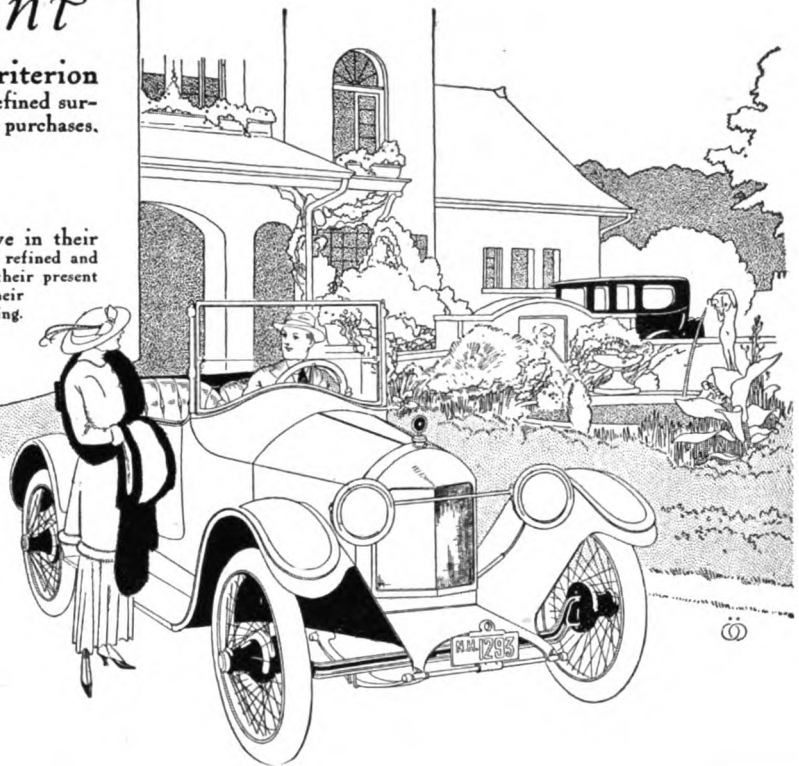
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provided through an auxiliary air valve, which will open only when there is sufficient suction for the purpose.

Proper construction of a carburetor is an exact art. At Fig. 3 is shown a type that has faults which prevent obtaining satisfactory carburetion results. Its chief constructional fault lies in the sharp bend in the mixing chamber, which would cause a part of the gasoline particles to adhere to its sides instead of passing on with the air. At high engine speeds a great amount of this liquid would be drawn into the cylinder in liquid form, which would result in a mixture that was too rich in gas and cause a considerable loss of power. The same applies to designs of manifolds, and the observant person will notice that on all recent models of automobiles that when a bend does appear it is gradual and not abrupt.

There are several forms of spray nozzles, or stand pipes, as they are frequently called. In Fig. 2 two typical designs are shown. The difference between A and B is that the latter is adjustable, since it is controlled by the needle valve. When this valve is used the spray can be regulated in a manner similar to that of the ordinary garden hose nozzle. Many designers instead of placing the needle valve in the stand

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pipe, have arranged it so that it is in an overhead position, as at C. This design is an advantage in that the body of the fuel is spread in all directions and has a better chance of vaporizing.

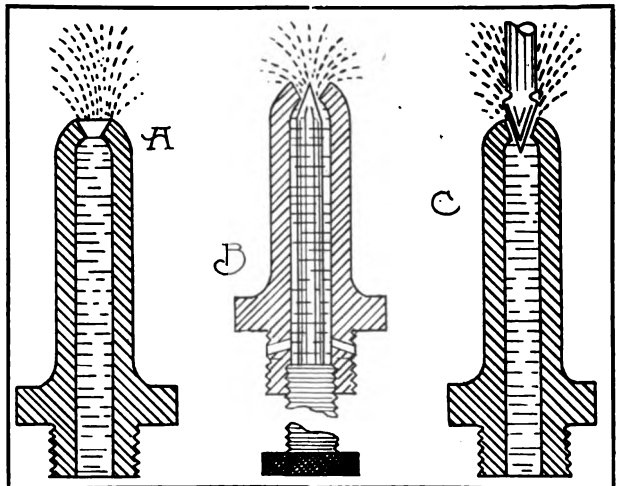


Fig. 2—Types of Spray Nozzles Much Used in Carburetor Designs.

Two types of floats are used with equal success, cork and metal. Though very buoyant, a disadvantage of the cork type is that it is liable to become gasoline soaked. To prevent this it is necessary at intervals to coat it with shellac.

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The hollow metal float is not affected by the fluid and will give trouble only when pin holes are worn in it. This trouble is not frequent, however, and for this reason many manufacturers prefer it.

The next subject for consideration is the construction and adjustment of the carburetors used on modern cars. The advice given to the motorist is, however, that if the carburetor is affording satisfactory service, leave it alone. Do not heed the advice of others by trying to improve its operation.

The Schebler Model R.

The first carburetor to be considered is the Schebler, model R, which is illustrated in Fig. 4. The principle employed is similar to that already described. The gasoline enters the float chamber, A, and contacts with the cork float, B. When the proper amount of fluid has entered the chamber the flow of gas from the storage tank is

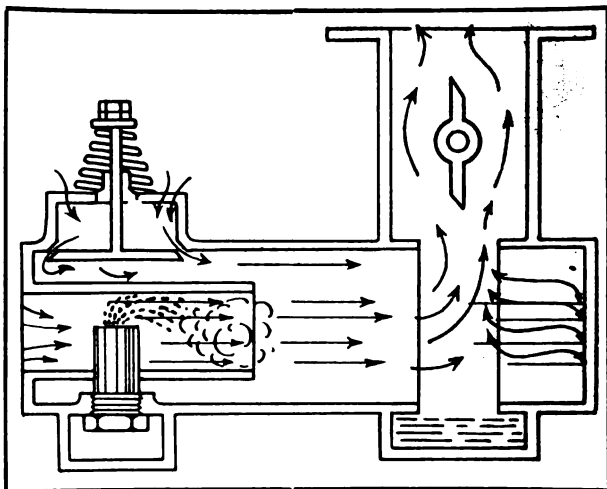


Fig. 3—Carburetor Whose Faulty Construction Makes It Impracticable.

shut off by the needle valve, C. The main supply of air is admitted through the passage D, and flows up through the venturi tube E, and suctions the gasoline from the spray nozzle F. As the engine speed increases sufficient suction is created to draw open the auxiliary valve G to admit more air to the mixing chamber.

It will be noted that attached to this auxiliary air valve is a lever, which is in direct communication with the needle valve that fits into the mouth of the stand pipe. As the auxiliary valve is drawn open, the lever raises the needle valve and thus compensates for the spray of gasoline. It is well known that in certain engines there is a slight interval between suction strokes. This would have a tendency to cause the auxiliary valve to flutter were it not for a device termed the dash pot.

This consists of a cylinder, I, and a plunger, J, which is attached to the valve. This arrangement tends to hold the valve steady and prevent its sudden opening and closing.

Under ordinary conditions the air adjustment, situated on the dash or steering post, can be regulated to answer all necessary requirements. This regulator is connected directly with the needle valve and when the air adjustment is pulled all the way out it lifts the needle valve out of the nozzle well and thus allows an increased quantity of gasoline to be admitted into the mixing chamber, which makes for easy starting. In addition to this the shut off valve, K, in the main air passage, is closed, which allows a very rich

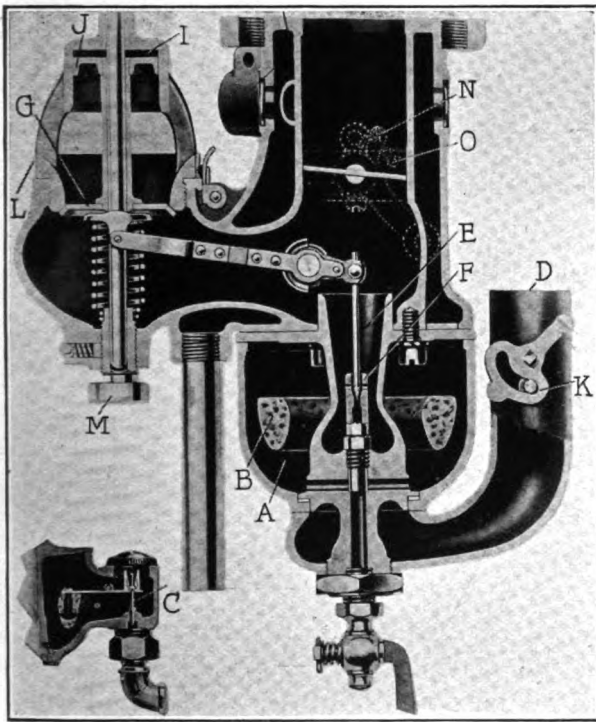


Fig. 4—Cutaway View of the Components of the Schebler Model R Carburetor.

mixture to be drawn into the cylinders. This extreme adjustment is for starting only, and as the engine warms up the adjuster should be pushed in, bearing in mind that it is desirable to operate with the leanest mixture possible.

Adjusting the Carburetor.

The auxiliary air adjustment is correctly taken care of at the factory and seldom requires the attention of the driver. However, if the carburetor causes irregular operation of the motor, make the first or low speed adjustment, as follows: Be sure the car stands where the temperature is about normal. Turn the valve cap L to the right,

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which will afford a rich mixture, until it can be turned no further. Start the motor at a low speed and turn the cap to the left, until the motor operates on all cylinders. Now throttle the motor as far as possible and continue the adjustment until perfect operation is obtained. This is the low speed adjustment. It will be seen from the illustration that by turning the cap to the right the needle valve is lifted from the well and allows a greater amount of gasoline to be sprayed in the mixing chamber. When the cap is turned in the opposite direction the needle is lowered in the well and decreases the supply.

To make the second, or high speed adjustment, advance the spark lever about two-thirds and suddenly throw open the throttle to the extreme limit. Should the motor hesitate or back fire, turn the spring adjustment screw M up until perfect operation is secured. This screw controls the tension of the spring which holds the auxiliary valve in its seat. By increasing the tension the valve is prevented from opening too freely and admitting too much air into the carburetor. Keep in mind, however, the advice previously given: That it is advisable to operate the motor on as lean a mixture as is permissible.

Should the motor operate too fast when fully throttled, this can be remedied by loosening the screw N which locks the adjusting screw O. Turn back the adjusting screw O until the speed of the motor reduces to the desired idle. If the motor runs too slow the screw should, of course, be turned to the right. Do not forget to lock the screw when the proper adjustment is obtained.

READERS' QUERIES

Anti-Freezing Solution, Tire Tubes That Pinch, Pumping Oil with Water, Why Cars Skid, Heating Attachment for the Carburetor.

Anti-Freezing Solution—B. H. S., Quincy, Mass.

What is considered the proper percentage of alcohol to add to the water of the cooling system so as to prevent freezing?

The amount of denatured alcohol added to the water of the cooling system depends mainly upon the temperature, that is, a smaller amount of alcohol can be used if the temperature does not drop to below zero than is necessary for a temperature below that point. The first operation is to drain all water from the system by opening all petcocks and allowing the motor to run. Denatured alcohol and water affords an efficient so-

lution when mixed in the following proportions:

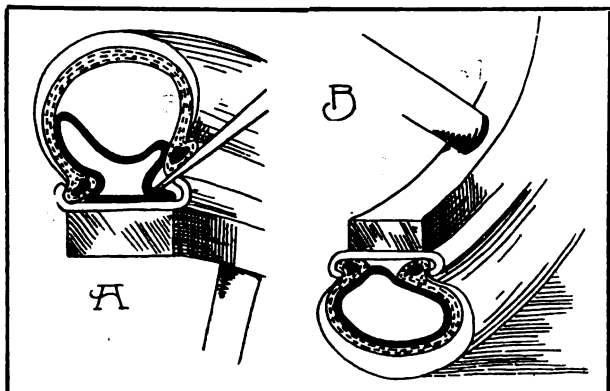
Water	Alcohol	Freezing Point Degrees Fahrenheit
95	5	25
90	10	18
85	15	11
80	20	5
75	25	-2
70	30	-9
65	35	-15
60	40	-23

The heat from the motor causes the alcohol to vaporize quickly and therefore care must be taken each day to add more alcohol to the solution so that the strength may be maintained.

Pneumatic Tires—H. P. B., Columbus, O.

Why is it necessary to inflate the tires to the manufacturers' schedule so that they ride almost like solid tires? I have never inflated the tires on my _____ car to the required pressure, yet I have received good mileage. Can you explain what causes the tube to pinch in the shoe when mounting?

If you have used tires which were underinflated and yet have received good mileage, you are to be congratulated more for your luck than



Sketches Illustrating How Inner Tubes Become Pinched and Ruined.

good judgment. With the tire well inflated there may be a little comfort sacrificed, but this is over balanced by the other results obtained. It may be stated that it requires less power to drive a well inflated tire than it does a soft one. As an example of this, did you ever ride a bicycle the tires of which were soft and then inflate the same to standard? It required less effort to propel the vehicle when the tires were "hard" than it did when they were soft. The plies of friction fabric form the basis of the tire. When the tire is under inflated, these plies are permitted to stretch and consequently loosen. Of course this cannot be noticed from the exterior. A tire in this condition is also subject to stone bruises. The accompanying illustration B shows the possible action of an under inflated shoe when turning a corner, which causes the fabric to stretch and the bead to pinch the tube. Pinching the tube when

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1916 Model
Metz "25" Roadster

METZ

"25" Roadster, 1916 model. Price \$600, completely equipped. Built on same chassis as Touring Car, with 108-

inch wheel base and carries identical equipment, including electric starter and electric lights, 25-horse power water-cooled motor, large wheels and tires, rain vision wind shield, instant one-man top, speedometer, built-in gasoline gauge, signal horn, etc. A wonderful hill climber, and for reliability in road performance is absolutely unsurpassed. Write for DEALER particulars and new illustrated catalog "Q."

NOTE—The Metz "25" Touring Car, 1916 model, completely equipped as above described, is also listed at \$600.

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(Signed) WM. H. BLACK, Member of Firm.

Sworn to and subscribed before me this 7th day of October, 1915.

(Signed) MICHAEL F. COSTELLO, Notary Public.

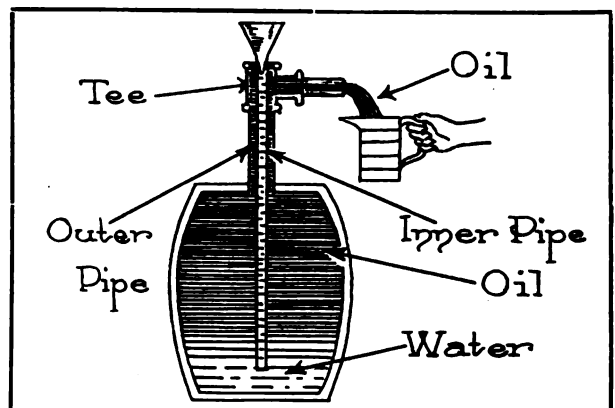
(Seal) (My commission expires June 30, 1917.)

(When Writing to Advertisers, Please Mention The Automobile Journal.)

mounting is mostly due to the tube being caught beneath the tire bead, as shown at A. Many times it is pinched by the tire iron. When mounting a tire the tube should be slightly inflated so that it completely fills the shoe.

HOME-MADE OIL PUMP.

The following suggestion of a pump with which to draw the last quart of oil from a barrel has been offered by a garage owner in a western state. The suggestion is based upon the fact that water is heavier than oil and that the two liquids will not mix. He suggests making a pump of two sections of piping, one within the other. The upper end of the outer pipe is threaded and to it is fitted a tee joint. The bottom is also threaded so that it can be screwed into the barrel. In the top opening of the tee a plug is fitted, and the plug is drilled and tapped to receive the end of the inner pipe, which should be of sufficient



Device for Pumping Oil from a Barrel with the Aid of Water.

length to almost reach the bottom of the barrel. A short piece of pipe is also fitted to the side opening of the tee. In operation, water is poured into the barrel through the centre pipe and it causes the oil to rise in the outer pipe and through the extension fitted to the tee. The amount of oil thus delivered will be equal to the quantity of water poured into the barrel.

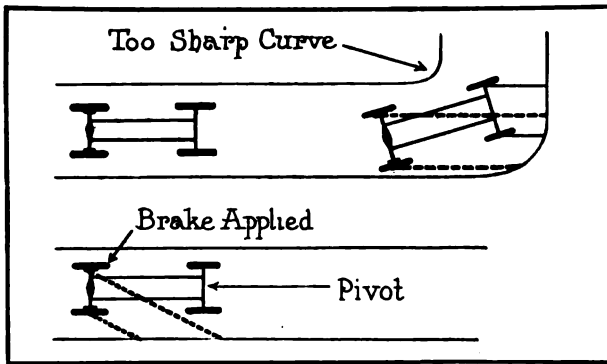
WHY CARS SKID.

Skidding generally takes place on a surface on which traction is difficult, such as a wet pavement. Usually the rear end of the car swings in a semi-circle, while the front end remains practically stationary and acts as a pivot. The speed of the car most often determines the violence of the skid, it being not unusual for a fast

moving car to swing completely around, sometimes making two or more complete revolutions. If the car maintains its equilibrium, the result is nothing more than fright and strain to the parts, but if it loses its balance then it will turn turtle, and, in the majority of cases, kill or seriously injure the occupants and maybe bystanders.

While wet surfaces induce skidding, the fault can generally be traced to the driver. If he suddenly throws in the clutch while the power is applied, or if he applies the brakes suddenly and tightly, or turns a corner too sharply, then the car is more than likely to skid, with results as aforementioned.

For the effect of the clutch suddenly thrown in or out, look to the railroad engine. If the engineer applies at once all the power under his control on slippery rails, the wheels spin without gaining traction. The effect is practically the same on the automobile, except that there are



Movement of Skidding Car Under Two Different Conditions.

no rails to keep the car steady.

When the brakes are applied suddenly, the effect is the reverse of the foregoing. The wheels cannot secure a purchase on the slippery road, and the momentum of the car throws it out of balance and swings the rear end around.

The effect of turning corners too sharply is different from the other two cases. In turning a corner the outside wheels must turn faster than the wheels nearest the inner curb, and, consequently, traction is reduced on the inner wheels, the result being that the car will continue to travel in a straight line. In this case all four wheels skid.

Among other causes for skidding are an unequal division of the load weight in the car body, uneven gripping of the brakes, and an unequal distribution of power. The accompanying illustrations show how the car travels during skids.

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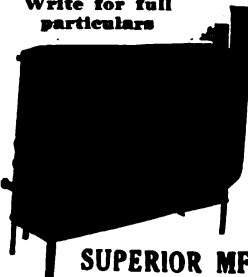
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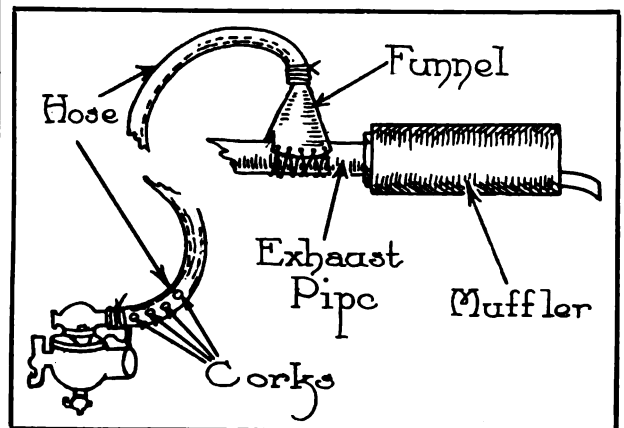
(2) **Dover Stamping & Mfg. Co., Cambridge, Mass.**

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HOT AIR ATTACHMENT.

At this time of the year it is necessary to pre-heat the air flowing through the carburetor if satisfactory operation of the motor is to be obtained. While all late model cars have some provision for heating, there are many cars of the earlier type that have none. A practical attachment which can be made at slight expense is shown herewith.

The stove consists of an ordinary funnel, which is so formed as to fit over the exhaust pipe. Wire can be used to hold it in place. A groove should be cut in the funnel so that it does not fit tight on the exhaust pipe. A space of about a half inch should be left for the admission of air. A piece of ordinary garden hose will serve as a channel for the air from the stove to the intake



Components and Assembly of a Home-Made Carburetor Heater.

of the carburetor. If an air adjustment should prove necessary, small holes can be cut in the hose near the intake of the carburetor and corks used to plug them. These can be removed when additional air is required.

HOME-MADE WATER PAIL.

A collapsible pail forms one of the handiest units of the motorist's equipment. Although one can be obtained at small expense, a practical substitute can be made from a discarded inner tube. Select a section about three feet in length which is absolutely water tight and then close one end by cementing it under pressure.

ETCHING ON STEEL AND IRON.

A suitable etching fluid can be made by mixing two parts muriatic acid with one part nitric acid. Cover the place to be inscribed with melted bee's wax and when cold write the inscription de-

sired in the wax, making sure to touch the metal with the sharp pointed marker. Next apply the mixture with a feather, filling the molds made in the wax. Carefully watch the result on the metal and when the acid has penetrated to the desired depth, apply water. This neutralizes the action.

TRouble FINDER SPARK GAP.

The spark gap attachment shown herewith provides for quickly locating trouble, regardless of the number of cylinders. It consists of a fibre block about an inch long and a half inch square. Drill and tap a $\frac{1}{8}$ -inch hole through the centre and lengthwise of the block. Cut a corresponding thread on two pieces of brass of $\frac{1}{8}$ -inch diameters. A $\frac{5}{16}$ -inch hole should then be drilled through the side of the block. Turn the wires in the fibre from opposite ends, so that both wires are visible at the opening. The wires should not

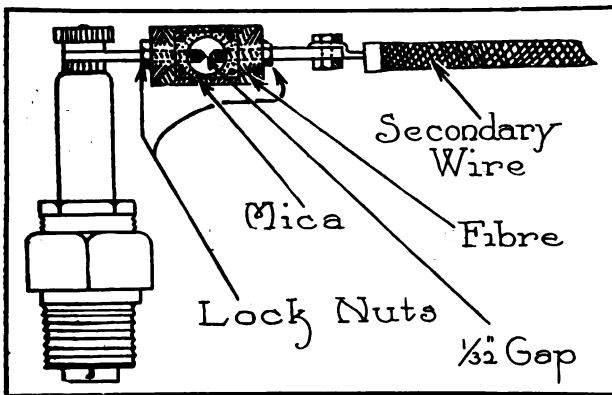


Diagram Showing How to Make a Trouble Finder Spark Gap.

be allowed to contact with each other, but should have a space of about $\frac{1}{32}$ -inch between the two. The wires can then be locked in position by two small nuts, as shown. Form a loop of the exposed ends of both wires so that they can be attached to the plug and secondary cable terminals respectively. The opening can be enclosed by recessing the sides of the block and then fitting pieces of mica. This can be secured to the fibre by drilling through the fibre and mica and inserting small machine bolts. The device also practically eliminates spark plug trouble. An instrument of this type can be attached to each plug, which makes the spark always visible through the mica.

Thick coats of paint should not be applied to the cylinders, as radiation will be effected. Special enamel is sold for this purpose.

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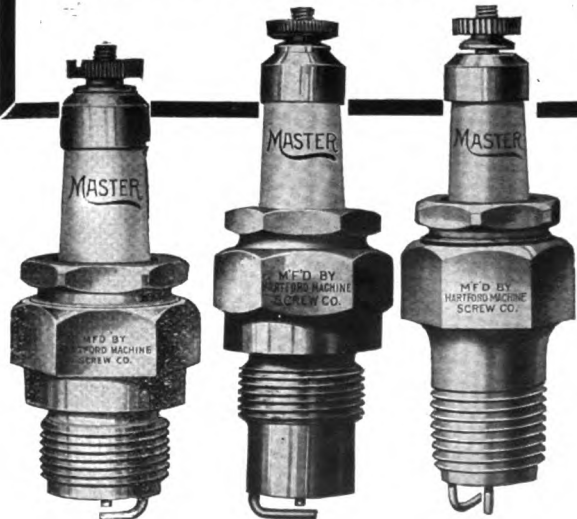
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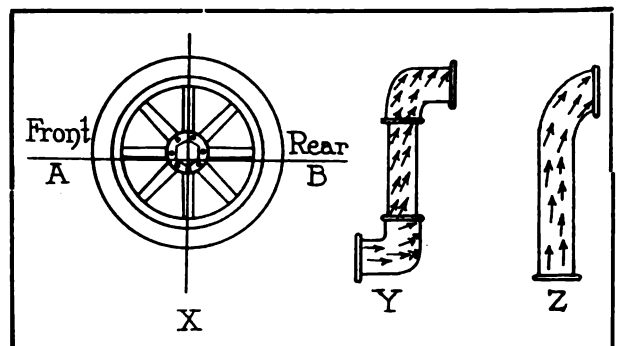
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LINING FRONT WHEELS.

It is absolutely imperative that the front wheels line, or track, properly; that is, the wheels must be parallel to each other and at right angles to the axle. If this condition does not exist, tire wear will be rapid and steering will be difficult.

It is good practise to test the wheel alignment at least once a month. There are several methods, but the one shown in the accompanying illustration is simple and accurate.

The sketch shows the inner side of a front wheel. At an equal distance from the ground draw a line as near to the centre of the wheel as possible. The line should be made exactly on the centre of the rim, but ordinarily the frame and dust pan prevent the extending of a gauge between the wheels at this distance. It is obvious that when both wheels are marked as shown, the alignment is easily ascertained.



X, Simple Plan for Testing Alignment of Wheels; Y, a Poorly Designed Manifold; Z, a Manifold Design with Maximum Possibilities.

Many experts advise a slight toeing in of the front wheels, in which case the distance from A to the corresponding point of the opposite front wheel should be $\frac{1}{8}$ of an inch less than the distance from B to the corresponding point on the rear of the opposite wheel.

MANIFOLD DESIGN.

The true efficiency of the motor depends greatly upon the design of the intake and exhaust manifolds, especially the former. The main object in view in most designs is to place the carburetor in a suitable position and yet to use a manifold as short as possible and to eliminate bends. It is essential, however, that for a multi-cylinder engine there must be an even distribution of the gas, if a well balanced operation is to be obtained.

It has been found by experience that a single

elbow will offer a resistance to the flow equal to that of a pipe that is 40 times as long as its diameter. It will be noted that on most recent models the bends in the pipe are gradual instead of abrupt, as in many earlier models. The method illustrated at Y shows a simple form of poorly designed manifold. This type uses two elbows. The frictional resistance of the joints as shown by the arrows is great and if a high temperature is not maintained in the manifold there is great danger of condensation. A much better design is shown at Z, there being but one elbow and a carburetor adapted that has a top opening instead of at the side.

REMOVING BROKEN STUDS.

The best way to extract a broken stud is to make a slot across the face of the bolt with a cold chisel and use a screw driver to turn the broken part out, as shown herewith at A. If it

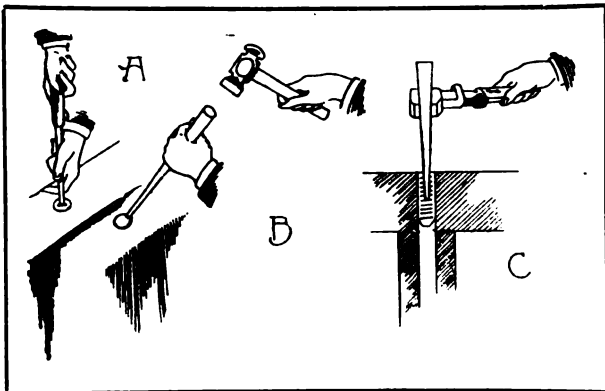


Fig. 105—Three Ways of Removing Broken Studs.

does not yield to this treatment, squirt kerosene around the threads and then tap close to the edge of the bolt with a taper point chisel and hammer, as shown at B. If it still resists, apply heat to the surrounding metal and apply the chisel and hammer again. If this method fails it will be necessary to drill a small hole in the centre of the stud and then drive in a four-cornered wedge-shaped punch. Apply a wrench to the top of the punch, as at C, and turn in an outward direction. The last resort is to drill out the part, using a drill which is the body size of the tapped hole, after which the hole should be tapped for the entire length. Care should be taken to start the drill directly in the centre of the broken stud.

Newly lined brakes are not always effective when first used. To overcome this condition sprinkle a little Fuller's earth between the lining and brake drum.

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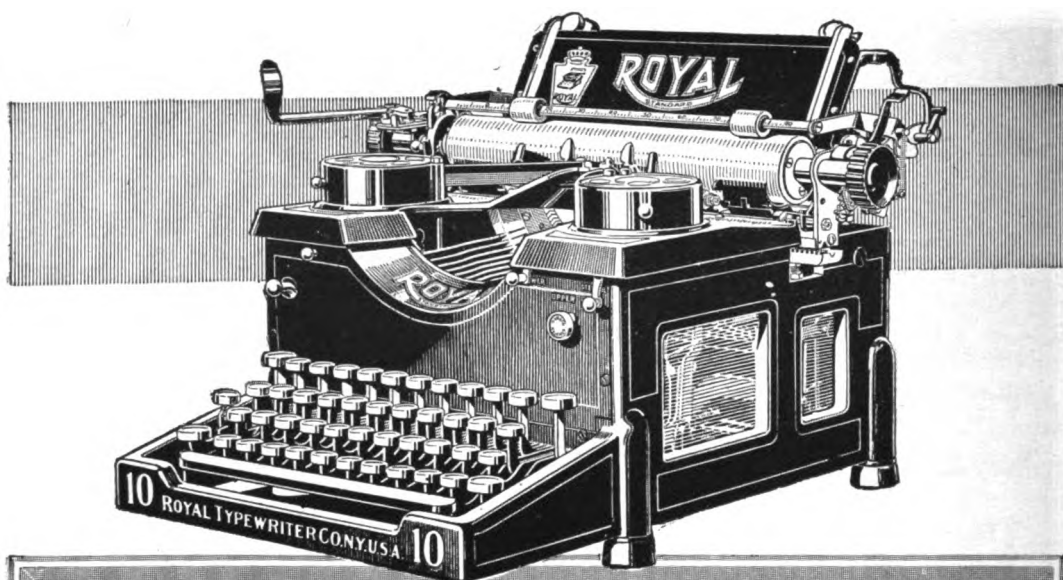
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Index to Advertisers.

	Page
Ahlberg Bearing Company.....	55
Barrett Manufacturing Co.....	63
Bosch Magneto Company.....	55
Coes Wrench Co.....	2
Culver-Stearns Mfg. Co.....	57
Dixon Crucible Co., Jos.....	54
Dover Stamping & Mfg. Co.....	67
Du Pont Fabrikoid Co.....	55
Eagle Oil and Supply Co.....	6
Eisemann Magneto Co.....	63
Gulf Refining Co.....	12
Harris Oil Co., A. W.....	54
Hartford Machine Screw Co.....	54
Hartford Suspension Co.....	61
Heinze Electric Co.....	50
Inter-State Motor Co.....	56
Mansfield Mfg. Corp.....	59
Marburg Bros.....	55
McQuay-Norris Mfg. Co.....	Cover
Mea Magneto Co.....	55
Mecca Mfg. and Spec. Co.....	6
Metz Company.....	57
Milwaukee Auto Spec. Co.....	61
National Auto Show.....	58
New Departure Mfg. Co.....	56
Nordyke & Marmon Co.....	63
N. Y. & N. J. Lubricant Co.....	59
Peerless Motor Car Co.....	57
Reo Motor Car Co.....	3
Royal Typewriter Co.....	4
Scripps-Booth Co., The.....	53
Splitdorf Electrical Co.....	60
Springfield Metal Body Co.....	7
Standard Oil Co., The.....	5
Staybestos Mfg. Co., The.....	62
Superior Mfg. Co., The.....	60
Texas Oil Company.....	63
Thermoid Rubber Co.....	56
Times Square Automobile Co.,	6
Valvoline Oil Company.....	63
Vanderpool Co., The.....	6
Wadsworth Mfg. Co.....	61
Weed Chain Tire Grip Co.....	61
Willys-Overland Co.....	Cover
Winton Company.....	1
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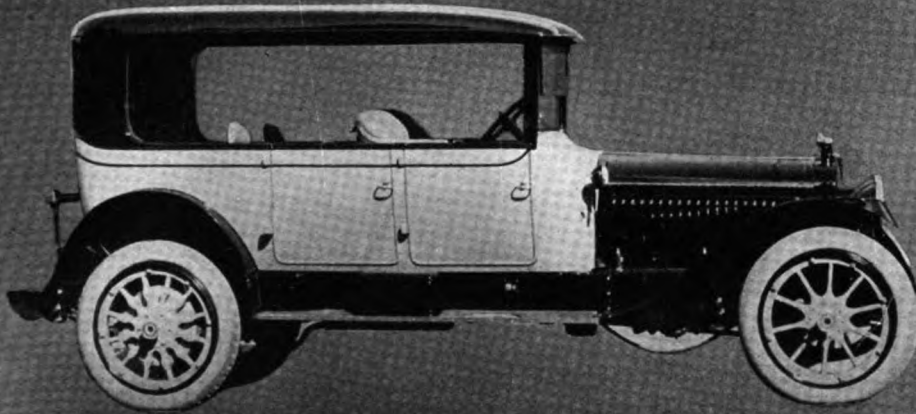
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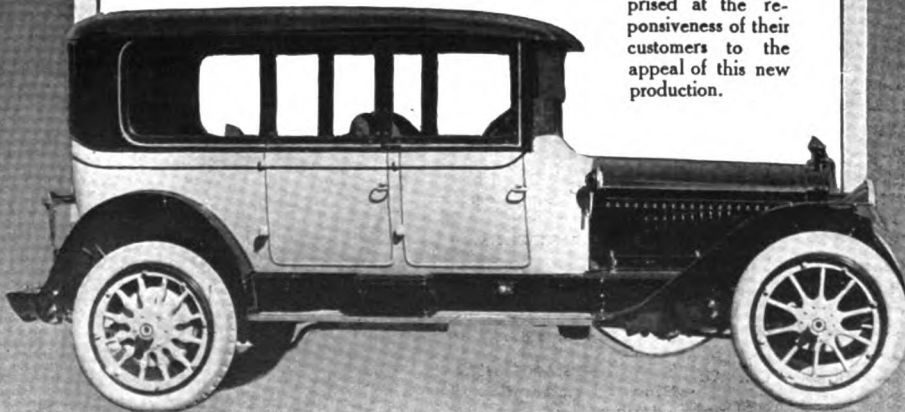
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DECEMBER 10, 1915.

NO. 9.

PUBLISHER'S AND READERS' PAGE.

THE Advance Number of the New York Show, the Dec. 25 issue of The Automobile Journal, will be unusually interesting and valuable this year. In addition to full mechanical descriptions of the new car models and the latest developments in accessories and supplies, there will be special feature articles, adequately describing and illustrating several new systems that are revolutionary in design and their application to motor car operation and maintenance. This year's show at New York will be the most representative and important ever held. Many of the car and accessory manufacturers have held back announcements of their new models until this event, preferring to show them for the first time to the thousands of visitors who will attend. These models will be described and illustrated in full.

Attention Is Directed to the leading article in this issue, the story of the modern farm tractor. In its application to the production of crops the motor tractor probably finds its greatest economic value, which is additional evidence of the position of motor vehicles in the scheme of modern life. It has taken many years to bring the farm tractor to its present point of efficiency, but as they now are constructed they are proving their practical adaptability and their ultimate economy of operation. This is one branch of the industry that is due to reach phenomenal proportions before many years are past.

Several Requests for sets of The Automobile Journal's Mechanical Books have been received, in consequence the suggestion offered in the last issue of this magazine. These are to be given away by subscribers as Christmas gifts and they form a most acceptable remembrance to any one interested in motor vehicles, their operation, maintenance and repair. Other subscribers who intend to include these sets among their gifts should send in their applications at once so that acknowledgment and shipment can be made before Christmas.

The New Owners Department contains a season-

able suggestion for storing the car during the winter months. It is practical advice and each suggestion offered will be found of much value at the end of the storage season, when the car owner takes the car out for the first run of the season. He will be rewarded by his patient care at this time by finding every component in as good operative condition as when he put it away. If any owner has special conditions which are not provided for in the story, he should write to the Editor of Mechanics, who will promptly and gladly extend his practical advice. Or if there is any mechanical problem the owner cannot readily solve, the editor will extend his assistance. This is a service for which there is no charge, and which will be given to any subscriber.

Many Letters have been received from subscribers who commend the serial describing the Ford car. Some of these readers are particularly interested in certain components and ask that these be described in an early issue. The writer of the serial explains that it would not be practical to discuss the various groups mentioned other than in logical sequence, but those subscribers desiring special information on certain parts can obtain the data by mail, by addressing letters in care of the Ford Department.

Motor Car Accessories, or at least a large number of them, may not be absolute necessities to the operation and maintenance of the car, but there is scarcely one that does not make for that comfort which lifts operation from a laborious task to the plane of pleasure. That is why there are hundreds of accessory manufacturers in existence.

and also why there is such a constant demand for their products. They are evolving new devices constantly, and it is the pleasure of The Automobile Journal to analyze them for the benefit of its subscribers. The concerns manufacturing the articles described in each issue are reliable and are worthy of confidence. Prospective buyers should refer to the Buyers' Reference and Guide for cars, parts and supplies.

Partial Table of Contents.

	Page
*Working the Farm by Motor Power....	13
American Cars in Importers Salon....	17
Coming Events.....	18
*General News of the Industry.....	19
Protest Against Special Taxation.....	23
*Motor Starting and Car Lighting.....	25
Legal Activities Affecting Motorists....	30
*Partin-Palmer Light Weight Four.....	31
*Pilot to Make Sixes and an Eight.....	33
*Alcohol as Motor Fuel in Europe.....	37
*Practical Motor Car Repairs.....	39
*Car Accessories and Equipment.....	42
*Suggestions for the Ford Car Owner....	45
*Ford Car Accessories and Equipment....	49
*Industrial Happenings and Comment....	51
*Practical Facts for New Car Owners....	52
*Readers' Queries.....	56

*Indicates article is illustrated.

The best estimate of number of owners of motor vehicles in the United States is 2,360,000.

These are served by approximately 40,000 industrial and trade interests—those who buy and sell.

Any publication of national distribution devoted to motoring, to the owner, the industry and the trade, with maximum circulation of from 20,000 to 25,000, can reach but a few of any of these classifications in any given section of the country

Every man engaged in industry or trade directs his endeavors to developing what is the most productive market—in those localities where it can be best promoted and stimulated, and where the returns will be assured. He concentrates his energies because he knows that scatteration is non-productive. He wants an enduring market.

There is no reason why a business man should not concentrate his advertising and promotion where it will be equally productive and certain of production.

The AUTOMOBILE JOURNAL has a distribution of 20,000 in a definite section of the country and to owners. It affords a service that is 100 per cent. in quality and quantity, that has a productiveness for advertising and promotion that cannot be approached, and in the greatest motor vehicle and accessory market of the world

CONCENTRATION is everything to the advertiser who wants results and a lasting market.

Other Facts at Request.

The Automobile Journal Publishing Company
TIMES BUILDING PAWTUCKET, R. I.

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Freely at Zero

Starts with the engine

THIS feature in an oil is of greater importance than you might think.

90% of the automobiles use Medium oil in the Summer—many change to a lighter weight oil in Winter upon

the recommendation of dealers who do not sell a Medium oil that flows freely at Zero.

Now,—the internal heat of your motor is just as great in Winter as in the Summer—hence, if Light oil is not the proper lubricant for Summer, *it is not the proper lubricant for Winter.*

A great many of the Light Motor oils thin out to such an extent from engine heat, that they are no better lubricants than Kerosene.

You therefore take chances if you shift to a Light oil for Winter motoring.

SUPREME AUTO OIL *Flows Freely at Zero.*

The coldest weather will not prevent its giving the most efficient lubrication, *for the reason that it contains no paraffine* to thicken under cold.

You may use the same grade of SUPREME AUTO OIL Winter and Summer.

SUPREME AUTO OIL produces less carbon, due to the fact that it contains no paraffine to gum and stick. The free carbon is blown out with the exhaust.

**There is More Power in
THAT GOOD GULF GASOLINE and
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FREE: Our booklet containing illustrated charts of Engine Details, Tire and Gasoline Records, and hints on Lubricating sent on request.

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THE AUTOMOBILE JOURNAL

VOL. XL, No. 9

DECEMBER 10, 1915

Price, \$1.50 the Year.

WORKING THE FARM BY MOTOR POWER.

Agricultural Tractors for Large and Small Farms Are Revolutionizing Farming as Power Machinery Revolutionized Industry.

THE power required to operate the farms of the United States exceeds that required by all the manufacturing industries combined, according to competent statisticians. Up to this time practically all of this power has been supplied by animals. At present there are 24,000,000 horses in use in the United States, and these supply the equivalent of about 14,000,000 mechanical horsepower.

Until very recently this gigantic power was used under conditions that had prevailed with very little change for hundreds of years. But science and system, which have made over the industrial world, are now seriously attacking farm improvement, and the change from animal to mechanical power on the farms is rapidly under way.

Growing population of the country, the consequent rise in farm land values, and the increasing

cost of buying and maintaining animals, owing to the fact that their subsistence is drawn from land that might otherwise be used to feed human beings, are rapidly creating conditions that make mechanical power cheaper than animal.

Science in Agriculture.

Systematic study of agriculture, which has been going on in American agricultural colleges all over the country, has produced great changes in many lines. It has developed the intensively cultivated truck farm near the great cities, where very high priced land is used at good profit by the growth of quickly maturing crops. These have been made to produce large yields, and the product is sold at good prices.

In sections further from the great cities crops with a single yield per season are more generally grown, but the



Cultivating the Farm at Rate of 35 Acres a Day with a Bullock Creeping Tractor Hauling Two Sections Disc Harrow.



Plowing Prairie Land to Standard Depth with a Small Type Tractor at the Exhibition at Fremont, Neb.

amount of preparation has been increased and great care is taken to provide conditions for a maximum yield.

On farms of this sort the question of labor is a great problem. It is employed only for short seasons and is seldom available in satisfactory quantities when it is most needed, nor is it always well skilled. Wages are increasing constantly. Much farm machinery has been provided for labor saving purposes, but until recently this has been of the type operated by horses and mules.

Although the general impression is that the largest farms are in the West, where they were naturally established because of the lower price of land, large farms are beginning also to be developed in the East. In many cases these are operated by western farmers, used to large scale operations, who have come East because of the better markets available and the reduction in the cost of marketing, which nearness to an outlet brings about.

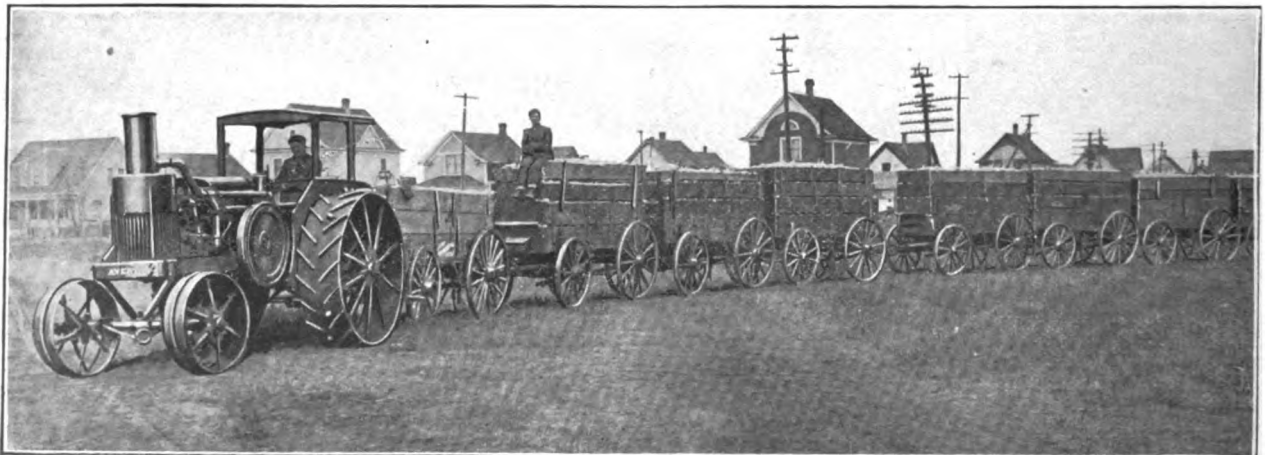
Power machines, which make unnecessary the maintenance of animals throughout the year, and on which maintenance expenses ceases when they are not in use, are today of vital interest to these eastern farmers, as well as to the ranchers of the West.

The farm tractor has now been developed to a point where it is unquestionably efficient. The various types burn both gasoline and kerosene and they may be had in a wide range of size and power.

The very large forms of tractors, many of them driven by steam, were the first forms to be developed. These were used on the many thousand acre tracts in the Dakotas and similar western states. The present development is important chiefly because the smaller size and consequently smaller cost of the machines is bringing them within range of the small scale farm operators. They are designed to do work that would require from two to 20 animals.

The pioneer machines were expensive and few farmers believed that they could afford to invest in them. Very few manufacturers, outside of the large firms engaged in making other forms of agricultural machinery, could afford the expensive development work demanded by the difficult engineering problems involved. They were faced with equal sales difficulties, because the farmer had to be educated up to the use of tractors.

The first sales efforts were directed along the lines of the replacement of horses, as, under the same circumstances, were those in behalf of the



Avery Tractor Drawing a Train of Farm Wagons, a Manner of Highway Transportation That Is Intensely Practical and Economical as Compared with Horse Haulage.

first motor trucks. Like the motor trucks the first tractors were not always successful and their performances set back the industry more than they helped. Now, however, the makers are fortified not only by a correctly designed and constructed tractor, but by knowledge of costs and the limitations of their machines. The machines are sold more largely on the basis of improved cultivation and greater crops than merely on that of economy.

American farms produce the largest crops in the world on the basis of the number of men engaged in their cultivation, but on the basis of the yield per acre they produce far less than do those of Europe. There the land is very valuable and labor comparatively cheap. American yields run from 40 to 75 per cent. of the yield per acre of the average European farm.

Agricultural success, according to the best authorities, depends on the quality of the seed, the adaptability of the land to the crop, the climate and the method of cultivation. By careful selection of seed and selection and proper fertilization of land two of these elements are placed under the control of the farmer.

The tractor is greatly improving the means of cultivation. The preparation of the soil is the most important and the more attention that can be given to this the better the crop. It has been found advisable to plow much deeper than formerly. It is also better to plow oftener with dif-



Another Example of the Work of the Tractor in Plowing Shown at the Exhibition at Fremont, Neb.

ferent types of plows, or discs, in order to thoroughly pulverize the soil to obtain better root beds and an accessible supply of plant food, to retain sufficient moisture and to kill weeds and insects.

The short time in which farm machinery is used makes the overhead and interest charges upon it comparatively high. But when it is not in operation there are no maintenance costs.

The tractor is justified because of the larger amount of work it enables the farmer to do in a given time and because, with good care, it can be made to last for many years. It may be worked 24 hours a day, and since its introduction night plowing has become a regular feature of agricultural work in some of the western states.

Tractors Reduce Labor Cost.

It enables the farmer to reduce labor costs. Fuel is always available. The expense per acre depends on the extent to which it is possible to use the tractor, but there is an elasticity in its



Kind of a Furrow That Is Made by a Gang Plow Drawn by a Tractor, This Being an Incident of the Prairie Plowing Demonstration at Enid, Okla.



Spectators at the Southwest Tractor Show at Enid, Okla.
—Note Tractors in the Background.

use and a reserve service which is of the highest importance.

It is generally held that each two horsepower of a tractor's rating can be considered equivalent to one horse in the amount of work that can be done. Manufacturers are considering the rating of their machines by the number of plows they can haul in a given condition of ground. This would be better understood by the buyers than a rating according to mechanical horsepower.

Tractor operating expenses vary, of course, according to the load on the machine, but the fuel consumption usually amounts to about a pint per hour per horsepower, and the lubricant 1/12 of that. The cost of labor for operating the machine will average from \$1.50 to \$2 per day. For ordinary farm work 50 days a year is probably as much as a tractor would be used, but much greater use is possible, as a belt can be attached to most of them and they can be employed for any such machine work as sawing wood, fanning grain, corn shelling, grinding fodder and pumping water.

Animals could not be used for many of these purposes. They work an average of about 100 days on the ordinary farm and the cost of food for each horse is about \$80 a year, or 80 cents for each working day. The department of agriculture declares that it requires 17 full days work a



Light Tractor for Hauling a Gang Plow, a Unit Designed for Small Capacity Farms.

year to care for a horse, which does not include the cost of shoeing, veterinary attention, depreciation, interest, taxes, insurance and stable rent.

The type of tractor to be selected for a given farm depends on a number of conditions. The machines are now offered in almost as wide a variety as are trucks and each size is adapted to a farm of certain dimensions growing certain crops.

Advantage Not All Economy.

Tractors should not be purchased exclusively on the basis of the number of horses that will be replaced, but in this connection it may be expected that a 12-horsepower tractor will replace two drivers and eight horses, that a 20-25-horsepower tractor will replace three men and 12 horses, and that a 40-horsepower tractor will do the work of five men and 20 horses.

Ten years is said to be the average life of horses and mules in farm work. The life of a



Two Sections of Disc Harrow and a Cut-Away Harrow Weighted with 400 Pounds of Stone Being Hauled by a Bullock Farm Tractor.

tractor has not been definitely determined. Of 18 machines built 13 years ago by one of the pioneer companies, 17 are still in service.

For three years middle western farmers have had the benefit of tractor demonstrations. This year exhibitions were held at Hutchinson, Kan.; Enid, Okla.; Champaigne, Ill.; Fremont, Neb.; Sioux Falls, S. D., and Bloomington, Ill. No prizes were offered, but manufacturers showed what their machines would accomplish under ordinary farm conditions. The Champaigne event was under the direction of the state agricultural college and was governed strictly by the interests of the farmer and improved agriculture rather than that of the tractor manufacturers.

The very large number of farmers who own automobiles and who are, therefore, more or less familiar with the internal combustion motor, greatly aid the adoption of tractors on American farms.

AMERICAN CARS IN IMPORTERS SALON.

AT THE Automobile salon, to be held at the Hotel Astor, in New York City, during the New York show, several American cars will be shown beside the usual display of foreign cars. The most prominent among the American cars are the new White models, exhibited at the salon because the company desired to place its cars among strictly high-grade makes where ample space could be secured.

Among the other American makes to be shown will be the Simplex, Crane, F. R. P., Singer, Owen magnetic, Brewster, Daniels eight and the Baker magnetic. Foreign cars will include the Rolls-Royce, Lancia, Delauney-Bellville and Isotta Franchini. The body makers already entered are Holbrook, Healy and Brewster. They will show many new designs and types on fine chassis of both American and foreign manufacture.

The withdrawal of the White company from the automobile show and its entry into the Automobile salon greatly increases the interest and importance of that exhibit, which until last year was limited strictly to foreign cars that appealed only to a small circle outside of automobile engineers and those interested in design.

The American cars entered were able to secure larger space and more favorably located than at the Palace show. Purchasers are enabled to examine the cars in a more leisurely way unhampered by crowds and in an atmosphere more attractive to buyers of high-grade productions.

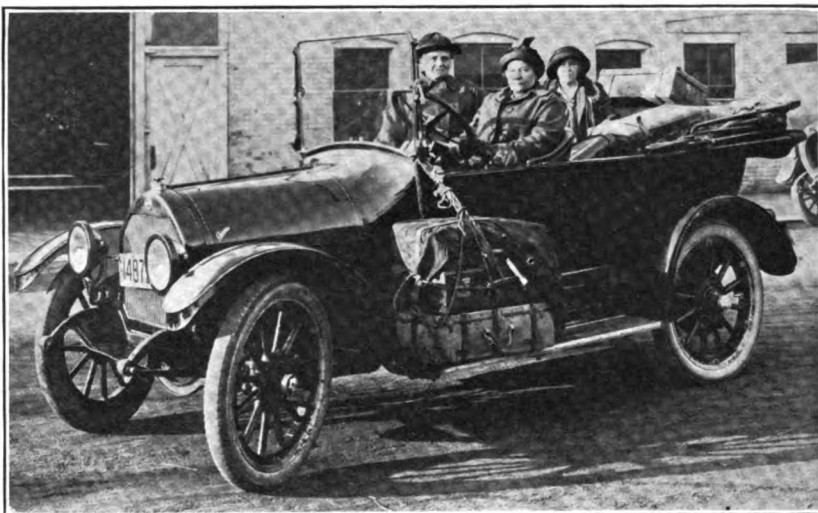
APPERSON MAKES HIGH-GEAR RUN.

Running from New York City to Boston and return on high gear without stopping the motor in 16 hours and nine minutes of actual running time is the recent mark set by an Apperson eight-cylinder light seven-passenger touring car. The distance covered was 488 miles, and in addition to William Robertson, the driver, the car carried three observers and checkers. The motor was run continuously before, during and after the trip

for a total of 26 hours, and no adjustments, replacements or repairs were made. The tires gave no trouble. The gasoline mileage was approximately 13 miles per gallon.

OVERLAND AIDS WOMAN SUFFRAGE.

An Overland model 83 recently made a transcontinental journey in the interests of equal suffrage. It carried three women from the San Francisco exposition to Washington, they being deputized to deliver a petition, which bore a half million names at the start and probably as many



The Three Feminine Transcontinentalists in the Overland Car That Made the Journey—Miss M. A. Kindberg, driver; Miss Ingsberg Kindstedt, Mechanician; Mrs Sara Bard Field, Utility Driver and Helper.

more at the finish, that asked for President Wilson's support for an amendment to the national constitution giving women the ballot.

The messengers were from opposite parts of the country, two being from Rhode Island and one from Oregon. They bought the car in San Francisco especially for the journey, and their faith was not abused, for no serious trouble was encountered en route. The car averaged 16 miles to a gallon of gasoline, and on the first leg of the journey, measuring 280 miles, consumed only one quart of oil. On the rough stretches the oil average was 100 miles. The women had several experiences which demanded exceptional "grit" on their part and a high degree of efficiency on the part of the car. Neither failed when put to the test.

PACKARD AEROPLANE MOTORS.

The Packard Motor Car Company, Detroit, is developing aeroplane motors for use in military aeroplanes. Much of the development work done on the Packard Twin Six motor will be applicable also to aircraft motors for military work.

The company declares that it feels it is the duty of manufacturing concerns who are able to develop productions that would be useful in war to do so to strengthen the hand of the government if it should become involved in military difficulties. Many of the directors have served in the army and navy and have also had much experience in aeroplane riding. Owing to this experience the company realizes the military needs of the country much more keenly than many other manufacturing concerns and the serious difficulties that would be encountered in the case of a sudden war.

GRAY WOLF MAY COME BACK.

Gray Wolf, the Packard racing marvel of more than a decade ago, is being groomed by its owner, Frank W. Ford, show man and automobile enthusiast of Dallas, Tex., and may soon make its appearance again in dirt track races.

The car was built in 1902 and was raced during the two following years against the best cars America and Europe produced. At Daytona Beach, in January, 1902, it broke the existing world's records and established the following marks: One kilometer, 29 $\frac{2}{5}$ seconds; one mile, 46 $\frac{2}{5}$ seconds; five miles, four minutes and 21 $\frac{3}{5}$ seconds.

MOTORS COMPETE WITH TRAINS.

Twenty-one Studebaker cars, operated by individuals who are organized and maintain ticket agencies at either end of the route, are giving fast automobile service on regular schedule between Los Angeles and San Diego, Cal., for lower fares than are charged by the railroads.

The run is 135 miles long and the schedule is agreed upon by the operators and maintained regularly. The railroad fare is \$3.85, or \$5 for the round trip. The motor cars charge \$2.50 one way or \$4.50 for the round trip.

A new and even better highway was opened between the two cities on Thanksgiving Day. The announcement that the San Diego fair is to remain open for another year will take a great

number of tourists and sightseers over the road during 1916.

Another line that appeals to tourists is operated from Los Angeles to San Francisco. This is made by a large number of Studebaker cars over both the valley and the coast roads.

HUPP SERVICE PLAN SUCCESSFUL.

Unstinted approval of the Hupp Motor Car Company's coupon service plan has been generally expressed by Hupmobile owners as the result of five months operation. The monthly quota of coupons are redeemed in 95 per cent. of the cases. There are now 2100 Hupp service stations all the way from Juneau, Alaska, to Miami, Fla., and they are being increased at the rate of 120 per week. The Newark, N. J., dealers have established 54 service stations in Essex county.

COMING EVENTS.

December.

- Dec. 14-17—International Road Congress, Worcester, Mass.
- Dec. 22—Annual meeting, Maine Automobile Association, Portland, Me.

January.

- Jan. 1—Show, Springfield, Mo.
- Jan. 1-8—Show, New York City.
- Jan. 3-9—Importers' salon, New York City.
- Jan. 5-6—Meeting, Standards Committee, S. A. E., New York City.
- Jan. 7-11—Convention, National Association of Automobile Accessory Jobbers, New York City.
- Jan. 7-13—Show, Milwaukee, Wis.
- Jan. 8-15—Show, Cleveland.
- Jan. 8-15—Show, Philadelphia.
- Jan. 10-15—Show, New Bedford, Mass.
- Jan. 10-Feb. 1—Show, Jacksonville, Fla.
- Jan. 14-22—Show, Dayton, O.
- Jan. 15-22—Show, Detroit.
- Jan. 17—Show, Wilmington, Del.
- Jan. 17-22—Show, Rochester, N. Y.
- Jan. 18-22—Show, Baltimore.
- Jan. 18-22—Show, Lancaster, Penn.
- Jan. 22-29—Show, Chicago.
- Jan. 22-29—Show, Montreal, Que.
- Jan. 23-30—Show, Portland, Ore.
- Jan. 24-29—Show, Buffalo.
- Jan. 29-Feb. 5—Show, Columbus, O.
- Jan. 29-Feb. 5—Show, Minneapolis.

February.

- Feb. 7-12—Show, Kansas City, Mo.
- Feb. 9-12—Show, Peoria, Ill.
- Feb. 14-19—Show, Des Moines, Ia.
- Feb. 19—Show, Newark, N. J.
- Feb. 20-27—Show, Grand Rapids, Mich.
- Feb. 21-26—Show, Bridgeport, Conn.
- Feb. 21-26—Show, Louisville, Ky.
- Feb. 21-26—Show, Omaha, Neb.
- Feb. 21-26—Show, Portland, Me.
- Feb. 21-26—Show, South Bethlehem, Penn.
- Feb. 21-26—Show, Syracuse, N. Y.
- Feb. 28-March 4—Show, Paterson, N. J.
- Feb. 29-March 4—Show, Fort Dodge, Ia.

March.

- March 4-11—Show, Boston.
- March 6-11—Show, Utica, N. Y.
- March 21-25—Show, Deadwood, S. D.
- March 28-April 3—Show, Manchester, N. H.

GENERAL NEWS OF THE INDUSTRY.

Goodyear Business for 1915 Reaches Total of \$36,000,000—Studebaker Reports Tremendous Earnings—Springfield Body Company Expands—Personal News.

THE Goodyear Tire and Rubber Company, Akron, O., reports that during the fiscal year 1915 it did a volume of business amounting to more than \$36,000,000, as compared with \$31,000,000 in 1914. The actual growth of the business was 17 per cent.—the difference being accounted for by material price reductions during the year.

President F. A. Seiberling told the stockholders at the annual meeting that all indications are for a 50 per cent. increase in volume for next year. Factory additions of more than 11 acres, now being constructed, will make room for the increased working force required.

"Goodyear," said Mr. Seiberling, "made over 2,000,000 tires in the year just closed. The demand for Goodyears means that we must make many more in 1916, and we are getting ready to make them as rapidly as possible. In addition we are building up a fine business in other lines. Neolin, replacing leather soles, has received a wonderful welcome, and our mechanical goods division, as well as the tire division, is booming."

In the election of officers at the same meeting three Goodyear men were rewarded for conspicuous services during the year with promotions. Secretary G. M. Stadelman, who has been sales manager throughout the Goodyear upbuilding, was made a vice president. He continues as sales manager. P. W. Litchfield, who has been with the company as factory manager almost since the beginning, was also elected a vice president. He will continue in charge of factory operations. With C. W. Seiberling, who was re-elected to office, Goodyear has three vice presidents.

A. F. Osterloh, formerly assistant secretary, was promoted to secretary. He is also assistant sales manager.

STUDEBAKER EARNS \$7,937,549.

Studebaker earnings for the nine months ending Sept. 30 are shown by the consolidated income account of the corporation as reaching a total of \$7,937,549 net. From that amount \$854,992 was deducted and the balance of \$7,082,558 was

carried to the surplus account. That account now registers, as shown by the following balance sheet, the total of \$10,619,678.

Sales for the period amounted to \$46,851,349, and from this was deducted \$38,857,339 for manufacturing, selling and general expenses, and \$298,471 for reserve and depreciation, which left net earnings on sales of \$7,695,539. These earnings were increased to \$7,937,549 by the addition of income from other sources amounting to \$242,010. From earnings \$854,992 was charged off.

The following is the consolidated balance sheet as of Sept. 30, 1915:

Assets.	
Trade name, good will, patents, etc.....	\$19,807,276
Plant and property, less reserve for depreciation	12,076,870
Investments in other companies.....	452,449
Inventories at cost or under.....	10,493,553
Accounts receivable	\$6,034,678
Notes	1,745,626
	7,780,304
Less reserve for bad debts and cash discounts	84,065
	7,696,239
Cash	7,416,396
Deferred charges to operations.....	408,948
Total.....	\$58,851,738
Liabilities.	
Preferred stock	\$11,758,000
Common stock	27,931,600
Minority stockholders' interest in capital stock of subsidiary company (Studebaker Bros. Co. Northwest)	28,300
Five per cent. serial gold notes, dates March 1, 1912, due \$400,000 each half year to March 1, 1922	2,308,500
Current accounts payable	2,835,823
Sundry reserve	1,233,354
Special surplus account.....	1,636,476
Surplus	10,619,678
Total.....	\$58,851,738

BRISCOE RECEIVES BONUS.

The Briscoe Motor Company, Jackson, Mich., recently received a check for \$10,000, which was the first installment of the \$60,000 promised by the local chamber of commerce if the company would locate in Jackson. The fund is made up by property owners who sold lots to the company and by those who benefited through the extension of a railroad spur through that section of the city to the Briscoe plant.

SPRINGFIELD BODY ENLARGES.

Comprehensive plans have been inaugurated for the enlargement of the field for the old Springfield Metal Body Company, Springfield, Mass. These include the organization of the Springfield Body Company with an authorized capitalization of \$1,000,000 to take over the old company and the construction of a large plant at Detroit, as well as the continuance of the old plant in Massachusetts.

These steps marked the embarking of the company on larger fields of endeavor under the leadership of President W. L. Fry of New York City. That the enlargements were necessary is evidenced by the statement that during the past 120 days the business of the company increased approximately 3000 per cent. and this despite the fact that \$1,000,000 worth of business had to be refused because the facilities were not large enough to handle the additional volume.

The reorganization brings in large financial interests of the East and West. E. W. McGookin, who has had an interest since last summer, is vice president and director of sales; Hinsdale Smith is vice president and chief engineer, and A. R. Smith is treasurer. These men, with President Fry and Frederick Fuller, compose the board of directors.

The officers make up a strong manufacturing and merchandising organization. Mr. Fry and Mr. McGookin have achieved wide recognition as business builders, and the Smith brothers are credited with having brought the modern body design, especially the convertible type, into present day popularity. The building of the first six-cylinder motor in this country is generally credited to them.

TRUMBULL MOTOR COMPANY QUILTS.

The Trumbull Motor Car Company, Bridgeport, Conn., has been placed in the hands of Judge E. K. Nicholson as receiver, who has instructions to continue the business until Dec. 10, when the affairs of the company will be closed up. This was the decision of the stockholders at a recent meeting. It will be recalled that I. B. Trumbull, president of the company, lost his life when the Lusitania sank, which is regarded as the second and final disaster to the company brought about by the war.

The company's assets are given as \$150,000, which includes cars finished and in various stages of manufacture, claims receivable and cash on hand. A statement of liabilities has not been

made public. The capital of the company is \$300,000 and of this \$170,000 had been paid in.

POPE DISPOSES OF ASSETS.

The Pope Manufacturing Company, Hartford, Conn., now owns no property, though it has \$60,831 in bank, and is holding notes and accounts receivable that total \$11,000, according to a report made by Col. George Pope, receiver for the Company in Connecticut.

Col. Pope has sold since the beginning of the receivership, Oct. 28, 1913, \$1,069,830 worth of merchandise, \$275,153 of machinery and equipment, \$380,000 land and buildings. In the last item is included the property that the Whitney Manufacturing Company purchased for \$300,000, and the West works, bought by P. Gargan, Inc., for \$80,000. The Westfield plant is in the hands of the Massachusetts receiver. The sale of assets reached a total of \$1,724,983.

LOST \$7,000,000 IN AUTOS.

Isaac M. Cate of Baltimore has announced that the books of the American Locomotive Company show that the total losses of the automobile department were more than \$7,000,000, and that of this amount \$2,300,000 has been written off by the company. The declaration is in line with Mr. Cate's attempts to obtain reforms in the management. Immediately following an investigation headed by him in 1913, the automobile business was abandoned, after having been in operation for about eight years. The company's product was a reproduction of the French Berliet car. One allegation by Mr. Cate was that in 1913 the company spent \$19,000 for entertainment cigars.

INCORPORATES DISCO COMPANY.

The Disco Electric Starter Corporation of Detroit has been incorporated with capitalization of \$250,000 fully paid in, and has taken over the business and good will of the Disco Electric Starter Company. Sydney W. Elston is president and general manager, J. F. Johnson of Grand Haven is vice president, and Sol Myer, banker and former baseball magnate of Indianapolis, is secretary and treasurer. These three men constitute the directorate. Mansell Hackett, manager of the old company, is general sales manager. The new organization is understood to have strong financial interests behind it.

20 MAXWELL MEN PROMOTED.

As a result of the annual sales convention of the Maxwell Motor Company, nearly a score of Maxwell executives were promoted and given extra responsibilities by President W. E. Flanders. Most prominent among the men promoted is John J. Plath, New York City, who was advanced from zone sales supervisor to sales manager of the Maxwell company. His former territory included New England, eastern New York State, New Jersey, Pennsylvania, Delaware and Maryland. In his new position Mr. Plath will devote especial attention to work in the field with dealers and distributors.

Another promotion was that of John Yoke to district supervisor of sales from sales supervisor of Maxwell zone five. In the new capacity he will have charge of all Maxwell field men and the 12 field headquarters of the company. C. E. Stebbins, assistant sales manager at Detroit and another to receive increased responsibilities, will handle all executive sales details arising in main headquarters. The following zone supervisors have been attached direct to the national sales staff with headquarters in the field: C. R. Newby (middle west), L. K. Cooper (East), and T. J. Toner (Pacific Coast).

Zone centres have been established at a number of additional points in the revised sales plan, and the following have been appointed supervisors: J. P. Headley (Atlanta), H. H. Howe (Pittsburg), E. M. Lubeck (Chicago), C. S. Riedel (Minneapolis), E. F. McConaha (Indianapolis), W. C. F. Morris (Memphis), G. E. Clarke (Kansas City), L. A. Smith (Dallas), W. J. LaCasse (Portland, Ore.), E. E. Thompson (San Francisco).

CULVER IS VICE PRESIDENT.

Charles R. Culver, for the past three years sales manager of the Stoddard Motor Car Company, Springfield, Mass., Pierce-Arrow agent for almost all the western New England territory, has bought an interest in the Stoddard company and assumes the duties of vice president while retaining direction of sales.

Before joining the Stoddard organization Mr. Culver was sales manager of the Knox Automobile Company. He now is a member of the Pierce-Arrow Company's efficiency committee. Regarding sales for 1916, he is confident that they will far exceed those of this year, although 1915 was remarkable for sales.

The Stoddard company has just completed additions to its plant that make it one of the largest agencies in New England.

PREMIER PLANT SOLD.

Frank E. Smith, trustee of the Premier Motor Manufacturing Company, Indianapolis, has announced that the plant, equipment, good will and two parcels of real estate belonging to the bankrupt estate, have been sold for the sum of



Three Maxwell Sales Executives Who Were Recently Advanced in the Organization and Assume New Responsibilities.

\$125,000. It is understood that a syndicate is the purchaser, though that fact and the name of the men composing it have not been announced officially. F. W. Woodruff, Joliet, Ill., acted for the purchasers. The name Premier is to be retained and the plant is to be enlarged for production on a larger scale than heretofore.

PRICES MAY GO UP ON CARS.

The materials situation brought about by the war is likely to hold the price of the moderate weight car at about where it is during 1917, if it does not actually force an increase. This is the opinion of W. O. Allen, general manager of the Allen Motor Car Company, Fostoria, O. While the output of the company since July 1 has been three times that of any year in its history, the

matter of materials has been a constant difficulty and an extra force of buyers has had to be employed, while a large number of orders have also been turned down. Price conditions, in Mr. Allen's opinion, will be determined largely by the duration of the war and the extra demand for materials which it has created.

MOORE IS ADVERTISING MANAGER.

Paul Moore has joined the Service Motor Truck Company, Wabash, Ind., as advertising manager. He has had broad experience along publicity and advertising lines in his connections in the past, which included the National Cash Register Company, the Shenango Pottery Com-



Paul Moore, Advertising Manager,
Service Motor Truck Company.

pany and the Weis Fiber Container Corporation, the last named being the company he left to join the Service truck company. While his activities have been outside of the automobile industry, Mr. Moore has always been interested in motor vehicles, particularly in trucks, and

consequently has given much study to them, especially to the possibilities of exploitation. A. B. Hanson, general manager of the Service truck company, states that "he is admirably fitted for his work as advertising manager for the Service Motor Truck Company."

PURITAN BUYS CARTERCAR PARTS.

The purchase outright of the Cartercar parts business by the Puritan Machine Company of Detroit was completed Dec. 1 through C. W. Nash, president of the General Motors Company. The contract, as executed by the Puritan company, provides that service for the Cartercar is secured complete in every detail as long as the life of the car.

This purchase is probably the largest made by the Puritan Machine Company and undoubtedly places the company in the position of being the world's largest distributor of "All Parts for All Cars." From humble beginnings of recent occasion the Puritan company has risen to control of the parts for cars of approximately 70 defunct and otherwise unoperating automobile companies. It is a unique and exceedingly important business and owners of cars among the 70 makers mentioned are dependent upon this company for replacement parts. The company's purchases include ownership of blue prints, drawings, dies, jigs, tools, etc., so that manufacture of the parts can be continued, although the original company has ceased production. That this feature is of immense importance to owners is very obvious by the constant demand experienced by the Puritan company.

CAPITALIZES SIMPLEX AT \$5,000,000.

The capital stock of the Simplex Automobile Company, New Brunswick, N. J., has been increased from \$1,500,000 to \$5,000,000, a certificate of amendment having been filed in Delaware. This is taken to indicate a great enlargement of the activities of the company.

COLE MOTOR STOCK INCREASE.

It is reported that the Cole Motor Car Company, Indianapolis, has decided to increase its capitalization from \$1,000,000 to \$3,000,000 to provide working capital for the greatly enlarged production contemplated for next year. Of the new stock \$1,000,000 will be seven per cent. preferred, convertible into common at par at the option of the holder at any time prior to Jan. 1, 1921. The balance of \$2,000,000 will be common stock.

The Cole company was organized by J. J. Cole in 1909, and in its first year of operation turned out 585 cars. During the last fiscal year approximately 3000 were produced.

HUPP BUYS AMERICAN GEAR.

The Hupp Motor Car Company has bought the American Gear Manufacturing Company, Jackson, Mich., at a price which is understood to approach \$1,000,000. The American Gear Company has been for years one of the most prominent automobile parts manufacturers in the country and has been the main axle source for the Hupp company.

PROTEST AGAINST SPECIAL TAXATION.

Organizations and Individuals Will Offer Strong Opposition to Proposed Levy upon Motor Cars, Fuel and Oil.

SECRETARY McADOO'S proposal to levy a special tax upon automobiles, gasoline and oil, which was incorporated into President Wilson's message to Congress, has drawn a vigorous protest from representative motor car organizations and individuals throughout the country.

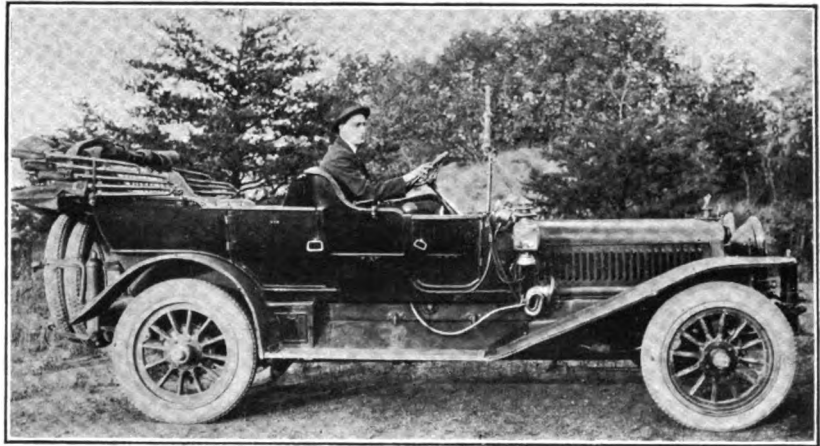
Charles T. Terry, who represents the National Automobile Chamber of Commerce as counsel, states that while he has not yet heard of any definite steps toward organization to fight the proposal, he believes that the opposition will assume the same shape as in the past. He further said that the arguments contained in his brief already filed at Washington are applicable to the present situation.

"The whole truth of the matter," he said, "is that automobiles are already taxed far more than any other form of personal property and without definite system or equity. Most personal property is taxed on an ad valorem basis, but motor cars are taxed in a variety of ways, not at all in keeping with their value. Taxing them on the horsepower basis (as is proposed by Secretary McAdoo) is an entirely exploded principle with men who have considered automobiles. Originally such a basis was advanced on the theory that high-powered cars wore the roads out faster than others, but that has been shown to be a fallacy."

"Discrimination" is the theme of many protests, which draw comparisons between taxation of motor vehicles and the freedom of horse drawn vehicles. Others argue that the proposed increase of a cent a gallon on fuel and 50 cents per horsepower on motor vehicles will work a positive hardship on thousands of owners of low-priced motor cars who even now, with the constantly advancing retail price of gasoline, are compelled to exercise rigid economy, so that they may keep their cars in operation. Among these can be

mentioned small manufacturers, farmers, keepers of small shops, contractors and thousands of others to whom a motor vehicle is not a luxury, but is as much a necessity as a horse would be.

The American Automobile Association reports that it is receiving at its Washington office communications by post and by mail from clubs and individuals that indicate a practically unanimous inclination to protest emphatically against this latest effort to "single out the motorist as a special road user and disregard the thousands of horse drawn vehicles. What may accentuate their dissent is that in many states



Vivian Prichett, Winner of \$500 Capital Prize in Winton Six Eighth Annual Repair Expense Contest.

owners now pay three taxes: For registration of the car, operating license for its driving, and also under the head of personal property."

WINTON SIX CONTEST RESULTS.

Twenty-five Winton cars made a combined mileage of more than 300,000 miles without requiring a single cent to be expended for repairs upon any of the machines. This is the first time in the eight annual contests for Winton prizes that every money winner ended the contest with a clean score. In these contests, in which there have been 135 winners, the cars have covered a total mileage of approximately 2,000,000 miles

at an average repair expense of 19¼ cents per thousand miles—which probably is the world's record.

The Winton Six contest was inaugurated in 1908, the year the Winton company began production of sixes exclusively, and has been renewed annually. It is open to all employed drivers of Winton Six cars, who submit monthly reports, which the owners of the cars attest. These reports are passed upon for awards by a committee of disinterested men not connected with the automobile industry.

The winner of the capital prize in the 1915 contest, \$500, was Vivian Prichett, Millville, N. J., who drove a car for S. J. Franklin 12,500 miles, the maximum distance set for the contest this year, without requiring the expenditure of any money for repairs. F. S. Weaver, Easton, Penn., driving for S. R. Bush, won \$400; A. C. Burton, San Francisco, driving for Mrs. T. B. Dozier, \$300; W. M. Newsome, Atlanta, Ga., driving for M. R. Hirsch, \$200. Twenty-one other drivers in various parts of the country won \$100 each.

A special prize for owners, awarded on the best record made by a Winton model 21-A car, was won by H. K. Browning, Tarrytown, N. Y., who will receive a new Winton car in even exchange for the car he is now driving.

PEDESTRIANS REQUIRE REGULATION.

Traffic authorities in Boston, Mass., have decided that it is time to enforce strict regulations upon pedestrians, making them liable to legal penalties. This agitation is in keeping with the results of recent exhaustive investigations of such street accidents as involve vehicles and foot travellers, which show that the latter in the majority of cases are at fault.

Everyone knows how reckless pedestrians are when crossing a street. It is recognized in Boston, and many other large cities, and the traffic officers are being urged to so regulate the pedestrian traffic as to keep it within the bounds of its own rights and to stop infringement upon the rights of vehicular traffic. It is a movement that is certain to meet with favor in all large centres where street accidents are of too frequent occurrence.

SHORT WEIGHT PROSECUTIONS.

An investigation of the containers used for oils and liquids in connection with automobiles has been conducted by Thure Hanson, commis-

sioner of weights and measures for Massachusetts, and he has discovered that many manufacturers have been giving short measure.

Numerous instances of shortages of from one to four liquid ounces in a container have been discovered and the loss to the buyer has been in some instances as high as 14 cents a can. Motorists in Massachusetts have been paying from \$25,000 to \$50,000 a year for materials that they have not received.

The commissioner has announced that he will begin prosecutions at once. At first these will not be directed at the retailers, but at the manufacturers. Retailers will be warned, however, not to sell short weight goods and manufacturers who do not heed the notice will be barred from doing business in the state.

LEWIS JOINS CAMPBELL-EWALD.

E. St. Elmo Lewis, generally considered one of the best known and most efficient advertising and sales executives in the country, has joined the Campbell-Ewald Company of Detroit, one of the largest advertising agencies in the United States. His time will be divided between the Detroit office and the new office recently opened by the company in New York City. He will have charge of a new department inaugurated with the object of increasing distribution by the development of bigger, broader and more practical markets.

Mr. Lewis has had wide executive experience and has been connected with the sales developments of some of America's largest corporations. Among other activities he organized and for nine years conducted the advertising for the Burroughs Adding Machine Company and was under Hugh Chalmers when the latter was advertising manager of the National Cash Register Company.

He goes to Detroit from the Art Metal Construction Company of Jamestown, N. Y., where he had been for the past 13 months under engagement by a syndicate of bankers to reorganize the factory, sales and administrative departments. He accomplished in 13 months what was expected would require three years, and at the conclusion was offered the presidency of the Art Metal company. He declined in favor of the Campbell-Ewald Company, which offered him a wider and more congenial field.

Accumulations of dust and grease on the porcelain of spark plugs furnish a path of escape for the current without jumping the gap to produce ignition.

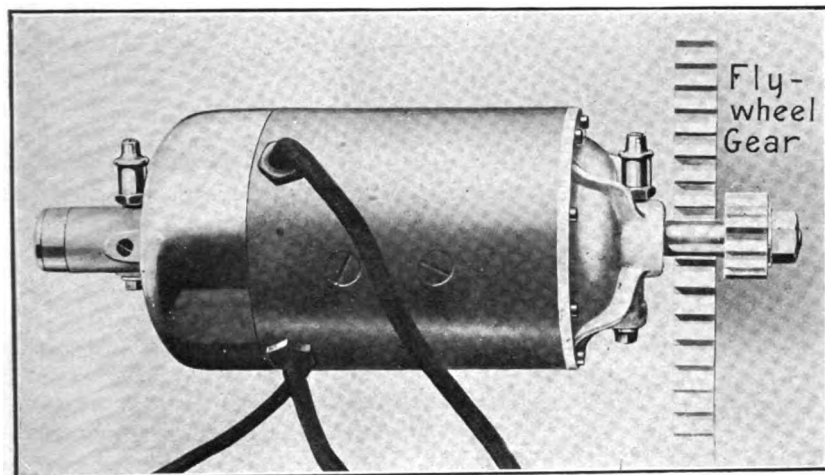
MOTOR STARTING AND CAR LIGHTING.

The Bosch Flywheel Starter (System Rushmore) In Which the Pinion and Ring Gear Are Engaged by the Solenoid Action of the Armature in the Field Coils.

THE Bosch flywheel starter (system Rushmore) was designed with a view of meeting a demand for an engine starter that could be ap-

be located to best meet the ideas of convenience of the designer, and it is equally as desirable on either side, but preferably it should be placed above the frame because of greater accessibility. When used with an open flywheel it may be installed on a machine in service with certainty that no quality will be sacrificed.

The system does not vary when used with a unit power plant, or with independent units, but there are a number of different sizes of motors to meet the conditions. For instance, types A8 and A13 are generally used for the engines of fire apparatus and tractors, and for heavy duty marine engines; types B2 and B5 are mainly intended for the engines of the largest size trucks and marine



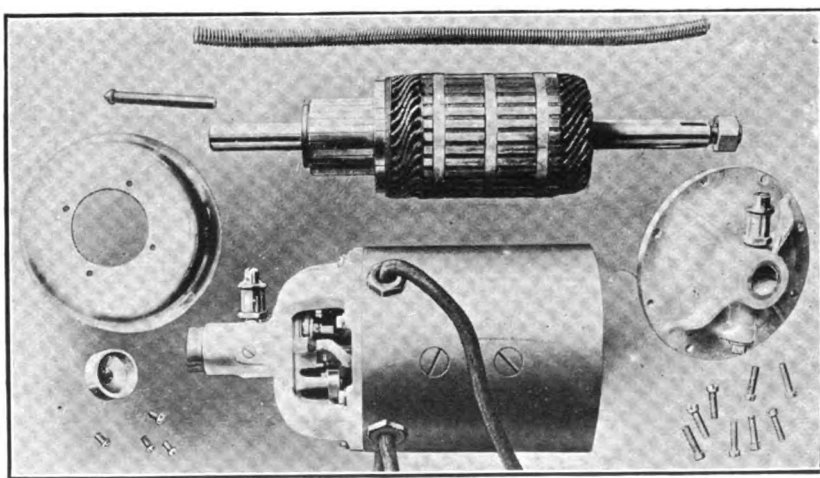
The Completely Assembled Motor of the Bosch Flywheel Starting System, Showing the Pinion Clear of the Flywheel Gear.

plied to the greatest number of types and designs, and it is an equipment that is as logical for a marine or stationary engine as it is for automobile pleasure cars.

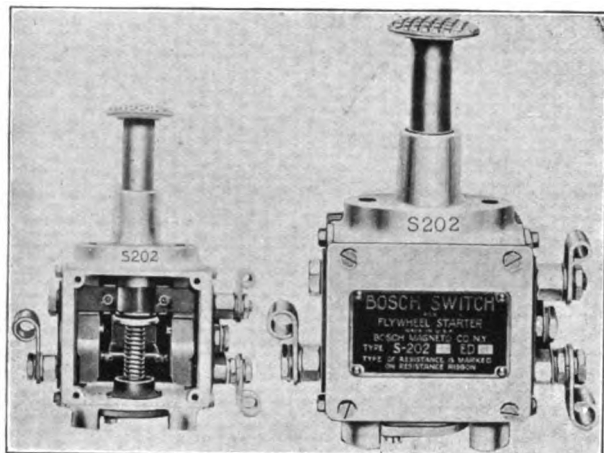
The ideal installation for starting an engine is that which was provided for in designing, as this will have every desirable quality, ample clearance for examination or work, full accessibility, substantial base and full protection against the normal causes for deterioration. The flywheel is regarded as an advantageous location for the application of power because it affords the greatest leverage and requires the least energy to turn the engine crankshaft.

As this form of starter requires an electric battery as a source of power, it may be used in combination with either a lighting equipment or independently as may be desired. When it is provided for in the designing of the engine it may

engines; types C3 and C18 are installed on medium sized automobile and marine engines; and types C41 and C42 are for the smaller automobile and marine engines. Thus one will note that the motors cover a wide range of usefulness, and the systems are used for a greater number of purposes than the other constructions.



Motor of the Bosch Flywheel Starting System Disassembled to Show the Principal Components of the Machine.



The Starting Switch of the Bosch Flywheel Starting System, Fully Assembled and with the Side Plate Removed to Show the Construction.

While these motors differ in size and in power they are, however, built to a single design, and the details of construction are identical in every particular. The motors are constructed with a view of enduring under very hard usage, for as they are used only for starting the engines they are very often heavily loaded for the comparatively brief periods they are in service.

Motor Must Endure Heavy Loads.

When the current is sent to a motor that is used for starting the amperage may be very high for so small a machine, and entirely beyond what it could be expected to endure if operated continuously. To illustrate, the amperage may be from 75 to 100 or more, depending upon the size, and the voltage may be either six or 12. The work required of the motor for such period as may be necessary to start the engine, which may be from 15 to 30 seconds normally, is necessarily very severe, and yet in ordinary conditions this does not impair the machines. Perhaps as good an illustration of the capacity of the starting motor as may be instanced is that it will, when functioning efficiently, start and accelerate the speed of the engine against a backfire explosion, the stresses of backfiring seemingly being sufficient to be destructive.

The motors are built in nine different types, and of these A8, A13, B2, B5, C3 and C42 are six volts, and A8, A13, B2, B5, C3, C18 and C41 are 12 volts. This is a total of 13 different sizes when voltage is considered.

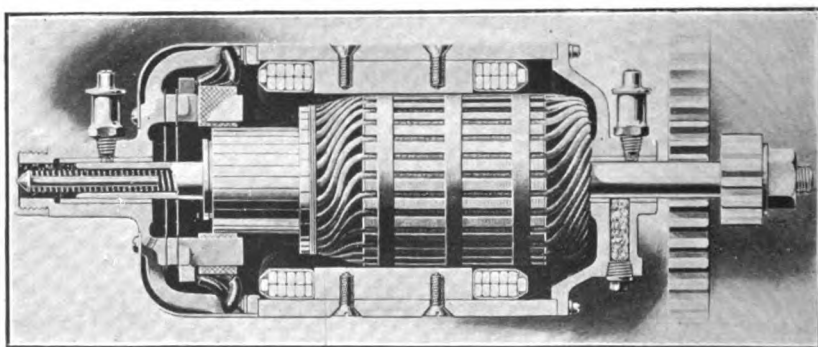
The motors are completely enclosed and are thoroughly

protected against dust and water, and are so designed that they are accessible for examination or work upon them. The frames are cylindrical steel castings that are easily machined and adapted. The frames are substantial and rigid and built to resist the starting stresses upon them. The end plate that carries the pinion end of the armature shaft is convex in external form with a flat edge flange the same circumference as the cylinder. This plate has a series of four webs or fins from the edge to the boss in which the bearing is machined, this construction affording rigidity for the long end bearing without materially adding to the weight. The plate is secured to the cylinder by a series of eight cap screws through the flat edge flange.

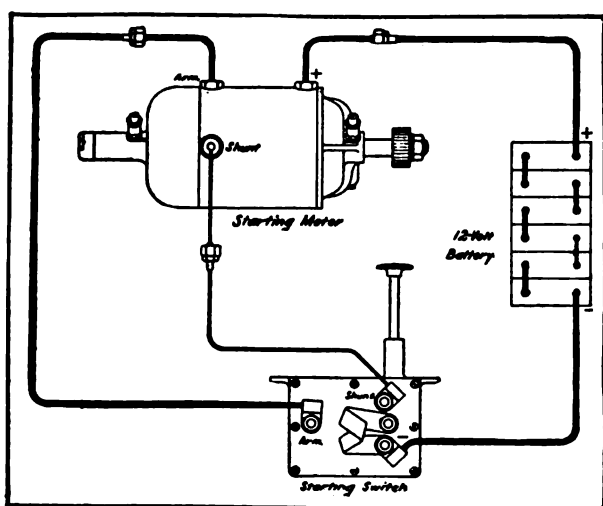
The commutator end of the case is a hemispherical frame with a large projecting boss in the centre that is machined to form the other main bearing for the armature shaft. This frame has a continuous base or flange, with four openings between the base and the central boss, through which there is access to the commutator and brushes, and there are substantial segments of metal between these to support the boss and the shaft bearing. This frame is secured to the cylinder by eight cap screws. It is covered by a sheet metal cover that has a central opening for the bearing boss, and which is forced on to contact with the edges of the cylinder and is retained by four cap screws. When the end plate, the frame and the cover are in place the motor case is dust and water tight and the construction is very solid, though there is no unnecessary weight and the commutator is accessible by the removal of the four screws and drawing off the sheet metal cover.

Construction of the Armature.

The armature is a slotted drum type. The armature core is constructed of soft iron laminae assembled on a sleeve and secured by end plates



Sectional View of the Bosch Flywheel Starting System Motor, Showing the Spindle and Spring in the Hollow End of the Armature Shaft.



Wiring Diagram for the Type A Motor of the Bosch Flywheel Starting System.

that are forced on and locked under heavy pressure. The soft iron plates are insulated from each other by coatings of enamel. The slots or channels of the armature are parallel with the shaft and into these the windings are placed. These are square copper wire that is insulated with cotton fabric, shaped on forms, with the commutator leads carried to the heavy copper commutator segments. The windings are secured in the armature core slots by three wide bands. The armature winding is impregnated with an insulating compound that also effectually protects it against moisture. The commutator is large in size, the copper segments being well insulated, and the number is such as will afford the most satisfactory degree of commutation of current as well as endurance.

The armature shaft is somewhat longer than in the conventional types of engine starting motor, which is necessary because of the method of starting. The shaft is carried in long, plain bearings, as it is subjected to heavy side pressure by the work it has to do. The pinion end of the shaft extends considerably beyond the outer end

of the bearing, and this carries a steel pinion. The other, or commutator, end of the shaft is within the motor housing.

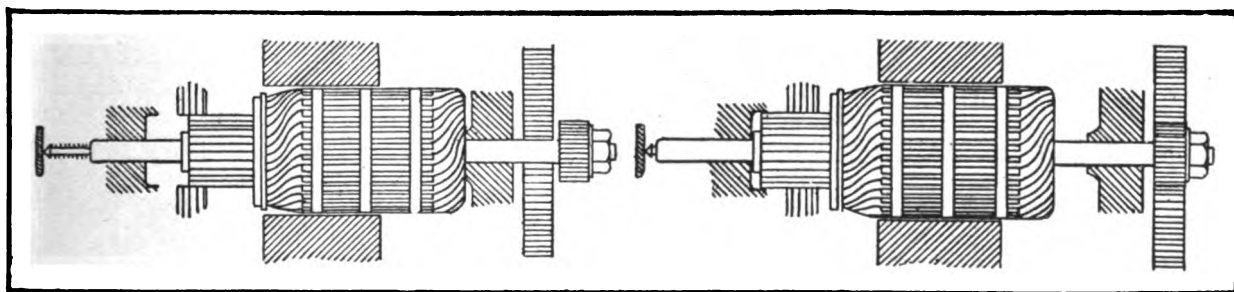
Spring in the Hollow End of Shaft.

The commutator end of the shaft is drilled and is hollow nearly to the commutator. In this is placed a helical steel spring, and within the spring is placed the shaft of a round-headed spindle, the spring just fitting the hollow shaft and the spindle fitting the core of the spring. When the spring is at its full length, or not under compression, the head of the spindle is against the inside surface of a cap that is screwed on over the end of the bearing boss.

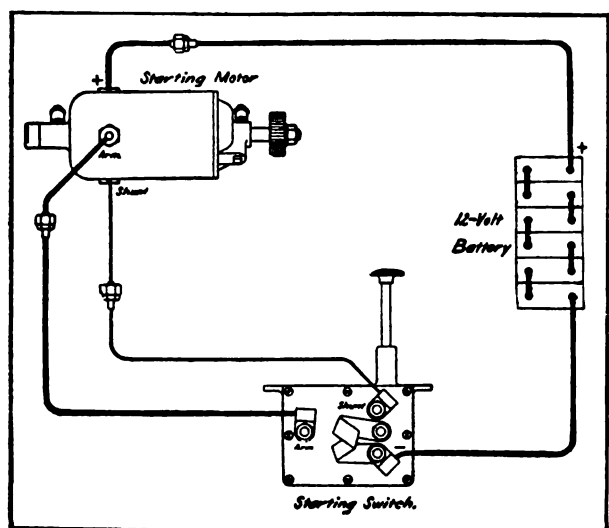
From this description one will note that the shaft may be moved longitudinally in the bearings, and that normally the pinion end projects with the internal boss of the end plate against the sleeve carrying the armature winding, while the spring surrounding the spindle maintains it in this position. When the shaft is moved in its bearings the spring is compressed and the spindle is forced into the core of the spring in the end of the shaft. The action can be clearly understood by reference to the sectional illustration of the motor, which details the construction.

Four-Pole Series Wound Motor.

The motor is a four-pole series wound type, that is excited by shunting a current through the field and armature during the movement of the switch, and one of the purposes for exciting the field is to create a solenoid action by which the armature is moved longitudinally in its case and on its bearings so as to bring the pinion on the outboard end of the armature shaft into mesh for starting. The stationary field coils are of a size that when arranged they nearly surround the armature core, and they are connected in series. There are four brushes of copper gauze mounted within the frame at the commutator end of the motor case, and the commutator is designed so that there will always be contact of the brushes



Diagrams Showing the Operation of the Bosch Flywheel Starter: At Left, Motor Armature in Normal or Non-Operating Position and the Armature Shaft Pinion Free of the Flywheel Gear; at Right, Motor Armature Moved Longitudinally in Its Bearings, and the Pinion Engaged with the Flywheel Gear.



Wiring Diagram for the Types B and C Motors of the Bosch Flywheel Starting System.

when the armature is moved longitudinally between them.

Ungrounded System Wiring Diagram.

By reference to the accompanying wiring diagrams for the insulated or ungrounded system, one will note that for the type A motors there is a heavy cable from the negative terminal of the battery to the lower of the two terminals at one end of the switch; a second heavy cable from the single terminal at the other end of the switch to a heavy terminal at the commutator end of the motor; a third heavy cable from the heavy terminal at the pinion end of the motor to the positive terminal of the battery, and a smaller cable from a small terminal of the motor to the upper of the two terminals at the end of the switch.

For the type C and C motors there is a heavy cable from the negative terminal of the battery to the lower of the two terminals at one end of the starting switch; a second heavy cable from the single terminal at the other end of the switch to the heavy middle terminal of the motor; a third heavy cable from the second heavy terminal of the starting motor to the positive terminal of the battery, and a smaller cable from the small

diameter terminal of the starting motor to the upper of the terminals at one end of the switch.

The large cables are for the main circuit and the smaller for the shunt circuit of the switch.

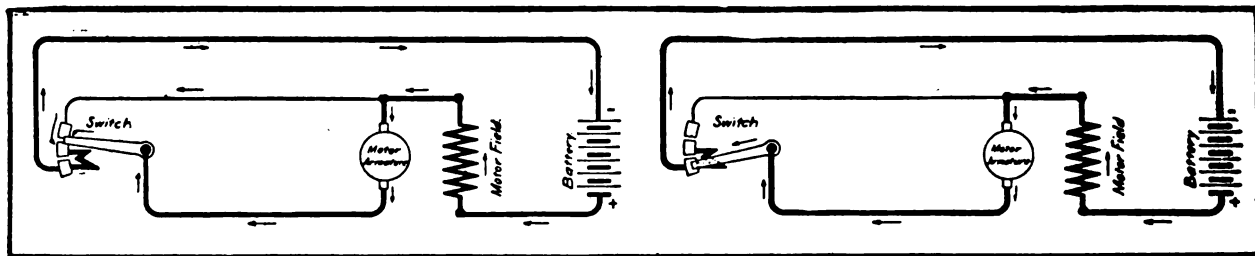
How the Motor Is Operated.

As may be assumed, the engine is started by the meshing of the pinion of the armature shaft of the motor with an external ring gear, which may be either in the form of a ring shrunk on to the circumference of the flywheel, or teeth cut into the flywheel, either construction affording a sufficient means of coupling. When the motor is installed it is so located that the pinion on the armature shaft extends beyond the ring gear, in which position the shaft is held by the spring encircling the spindle in the hollow commutator end.

This is the normal position of the armature of the motor, and it is not in line or at the centre of influence of the field coils. When the starting switch is depressed the first contact causes a current to pass from the battery through the switch "shunt," the value of this current being determined by resistance, and this current is absorbed first by the armature and by the field coils, this being so divided that there is a very slight flow to the armature in comparison with the flow to the field coils. The current transforms the field coils into a very powerful electromagnet, and this instantly draws the armature longitudinally in its case and on the bearings into the magnetic centre of the field coils. This movement compresses the spring against the head of the spindle in the hollow shaft end, and as the excitation of the armature causes it to revolve slowly, there is a turning as well as a sliding movement.

The Action of the Switch.

As the armature slides on its bearings the pinion on its shaft is drawn into mesh with the ring gear on the flywheel. With the further depression of the switch the shunt current to the armature and the field coils is interrupted and the current is then supplied to the motor as a series wound machine, through the armature and field coils, and it will continue to accelerate until the



Diagrams Showing the Electrical Circuits Formed by the Switch: At Left, the Circuit Formed by the First Part of the Downward Movement; at Right, the Circuit Formed When the Pedal Is Fully Depressed.

engine firing is begun. The motor will turn so long as the pedal switch is depressed, but as the motor is relieved of its load with the starting of the engine, the current supplied will diminish, and as the strength of the field magnets are lessened the tension of the compressed helical spring will overcome the magnetic attraction and the armature shaft will be carried longitudinally through the bearings to its normal position, this automatically throwing the armature shaft pinion out of mesh with the ring gear of the flywheel.

If the pedal switch is not released when the engine begins to fire the current flowing through the armature will cause it to revolve freely, but without meshing with the flywheel, because the strength of the current is not sufficient to overcome the tension of the spiral spring.

The Switch and the Batteries.

The switch that is used in connection with this system is what is known as a pedal type, it having an upright plunger that is maintained in an "off" position by a helical spring encircling it, and which is so constructed that a series of contacts necessary in the cycle of operating the motor is always correctly made. The plate that carries the terminals of the switch also supports the metal band or strap, which is termed the switch "shunt." The cable terminals are secured to the switch by lock nuts and washers. Should the switch be connected too quickly the motor armature would be revolved, but the pinion would not engage with the ring gear of the flywheel, and the operation must be repeated. No untoward result can follow the quick depression of the switch, but after it is pressed the foot should be removed so that the switch can be disengaged by the tension of the spring.

The battery used with the system ought to be so located that it may be enclosed in a metal box that will thoroughly protect it. The shorter the cable connections are the better as a rule, because of the smaller probability of wear and deterioration. The batteries used with the different motors are in sizes as follows:

Motor Type	Battery Voltage	Ampere Hour Capacity
A8, A13, six volts	6	160
A8, A13, 12 volts	12	80-100
B2, B5, six volts	6	120-150
B2, B5, 12 volts	12	80
C3, six volts	6	100-120
C3, 12 volts	12	50-60
C18, 12 volts	12	50-60
C41, 12 volts	12	35-50
C42, six volts	6	80-100

(To Be Continued.)

INJURED CAUSE MOST ACCIDENTS.

According to statistics collected by the New York police department, and made public by the National Automobile Chamber of Commerce, 90 per cent. of accidents occurring in New York City, in which motor vehicles are involved, are caused by the injured.

The department has adopted a form for reporting these accidents, which classifies them according to cause, location, nature, seriousness, type of vehicle involved, age of injured and time of day.

Of 1033 accidents in August, 903 were reported to be the fault of the injured, 51 the fault of the drivers, 45 to defects in the vehicles, 34 to skidding and 48 to other causes. Of 743 persons struck by vehicles, including bicycles, 679 were killed or injured as a result of their own fault, and only 31 such accidents were due to the drivers, in the view of the police.

The report shows that accidents increase steadily from January to July and then decrease from July to January. Most of them occur between 11 a. m. and noon and from 5 to 7 p. m. Of those killed and injured 45 per cent. are children, and the largest number of children killed or injured are between two and eight years.

WANTS HIGHWAY DEPARTMENT.

Of the 48 states there are only six that have not yet established state highway departments. One of these is Indiana, but a determined effort, led by the Indiana automobilists, is being made to establish a department. Every county is being organized by the American Automobile Association.

The idea is that the federal government may shortly embark upon a policy of federal aid to road building and that it will give such aid to only states that have central departments, capable of properly overseeing the work. The plan for federal aid most favored is one by which the road money will be given on the basis of \$1 raised by a state to every one appropriated by the federal government, and that these appropriations shall be divided according to area, population and road mileage—a definite standard which would obviate the log rolling and scandal of the river and harbors and public building appropriations.

Georgia, South Carolina, Mississippi, Nebraska and Texas are the other states that have not yet established state highway commissions.

LEGAL ACTIVITIES AFFECTING MOTORISTS.

AMONG the recently proposed or enacted legislation affecting motor car owners and operators is the bill that was filed in Massachusetts to make the penalties for violations of the automobile laws and ordinances more drastic. It deals with two aspects of motor car driving: Running away after striking a pedestrian, and operating a car while under the influence of intoxicants, and in both cases is quite severe.

The bill provides that if a driver of a motor vehicle is involved in an accident and then runs away, not only he, but the occupants of the car as well, shall be liable to fines ranging from \$100 to \$1000, or imprisonment for a period of three months to three years, or both. In the event that a person is killed as the result of the accident, the driver and occupants running away shall be liable to imprisonment for not less than 10 years nor more than 20 years. The bill further provides that failure to stop shall constitute prima facie evidence of criminal intent and willful neglect, and in a suit for damages the judge shall order that whatever sum be awarded by jury shall be tripled, if the injured person wins.

In the case of conviction for operating while under the influence of intoxicants, the clerks of courts are required to notify the highway department within 24 hours of the conviction. Permanent revocation of a driver's license will be the invariable penalty for a second conviction.

262 Arrested in New Hampshire.

The total number of prosecutions for all kinds of violations of the automobile laws in New Hampshire in 1915 was 262, as compared with 83 in 1914 and 25 in 1913. Of the number of arrests this year 42 were for operating motor vehicles while under the influence of liquor, against 14 in 1914 and only nine in 1913. There were this year 99 prosecutions for excessive speed, 30 for failure to carry papers, 20 for operating unreasonably, 20 for driving when unlicensed, 14 for failure to carry plates, 13 for operating recklessly, 12 for driving when unregistered, eight for lack of proper lights, four for refusal to stop, three for failure to give signals, two for manslaughter and one for carrying counterfeit plates.

New Traffic Rules in Ohio.

Beginning Dec. 5 a new set of traffic rules and regulations were effective in Ohio. They are provisions under the new Cass highway law and were prepared by Clinton Cown, state highway commissioner. Some must be obeyed under law

and others constitute mere suggestions. Among the prohibitions are, riding on any vehicle without the consent of the driver, unnecessary emission of dense smoke from motor vehicles and permitting domestic animals to run loose on highways. That all vehicles, whether horse drawn or motor driven, be equipped with lights comes under the head of a suggestion.

Nebraska Bans Joy Riding.

The Omaha Automobile Club in Nebraska has begun co-operation with motor car owners to minimize the practise of unauthorized persons of taking cars from garages and streets for the purposes of joy riding. A Nebraska law provides a fine not exceeding \$100 or three months' imprisonment for persons convicted of taking cars in that manner.

Lynch Law for Car Thieves.

The chief of police of Akron, O., has suggested the organization of a body of citizens, or duly authorized officials, for the purpose of hanging or otherwise dealing violently with motor car thieves. He bases his suggestion upon the practise of hanging horse thieves in days of old, and declares that car owners are justified in demanding the same treatment.

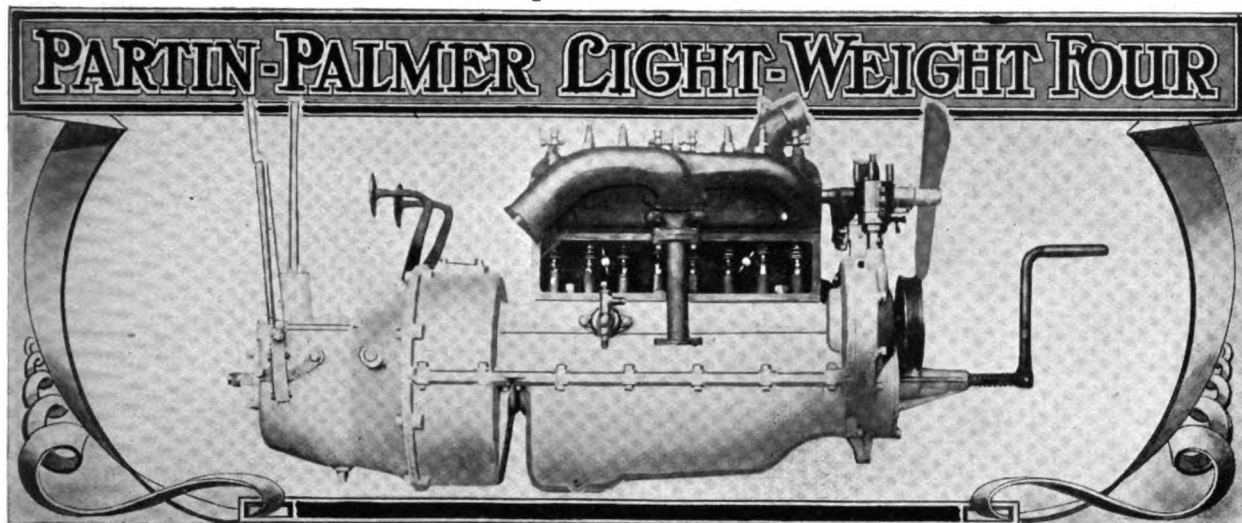
Dislike St. Louis Law.

Accessory dealers and insurance agents in St. Louis are complaining bitterly of the new dimming ordinance recently passed by the city, which requires that the rays from headlights be less than three feet from the ground 75 feet away from the car. The dealers say that the ordinance has cut down their business, that it keeps automobilists off the streets at night through fear of arrest, and that many accidents have resulted.

Finger Prints for Motorists.

Motorists convicted of driving automobiles in New York City while under the influence of liquor are likely to have their finger prints filed in the archives of the police department. This is according to a suggestion made by Commissioner Woods to Chief Magistrate McAdoo. He would also include speeders, and autoists who drive away after having injured a person.

The New York law provides that three convictions for speeding will result in revocation of a driver's license. The commissioner contends that it is practically impossible under the present system to definitely ascertain whether a motorist has ever been arrested. The finger print idea is suggested to overcome this defect.



A CAR which weighs but 1950 pounds and yet is spacious and comfortable with accommodations for five people, is the most recent production of the Commonwealth Motors Company of Chicago, Ill., maker of the well known Partin-Palmer pleasure automobiles.

The car is well powered with a four-cylinder water cooled motor that has a cylinder bore of $3\frac{1}{2}$ inches and stroke of five inches. The power plant is suspended at three points. It has all of the qualities that are regarded as essential or durable in automobile engines. The cylinders are cast en bloc with spacious integral water jackets which entirely surround them and the valve chambers.

The water inlet is located in the centre of the cylinder block opposite the valves at the bottom of the jacket, so that complete drainage of the jackets through the radiator is obtained. The cylinder head is cast separately, allowing space for large valves and insuring perfect setting of cores and even thickness of the walls of the castings. With a removable cylinder head there is ready access to the interior of the cylinders and the valves.

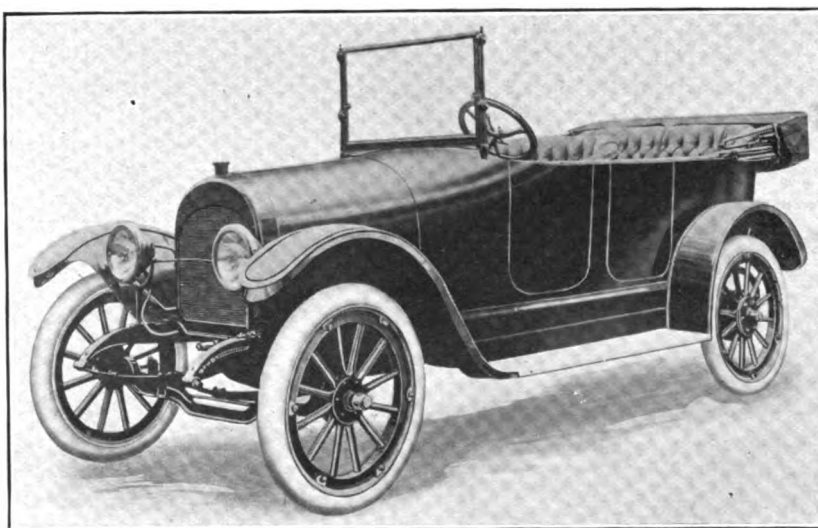
The reinforced aluminum crank case is cast in two sections and it completely incloses the flywheel and multiple disc clutch. Strong webs are provided for supporting the crankshaft bearings, and provision is made for removing the bearing caps easily.

The oil pan, which has a capacity for five quarts, is bolted to the bottom of the crank case and is easily removable. It is possible to take out any of the connecting rods and pistons without disturbing the adjustment of the main bearings.

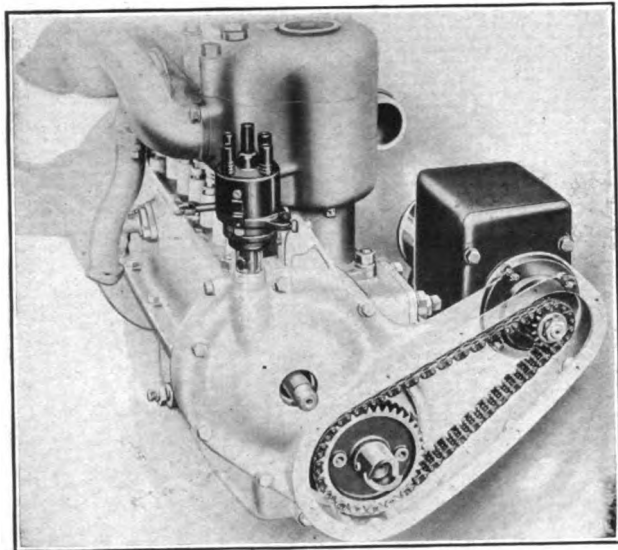
Even Lubrication Assured.

The constant level splash system of lubrication is used, the level being maintained in the engine base by a plunger pump driven by an eccentric on the camshaft. Each connecting rod is fitted with an oil scoop, which distributes the oil by splash, insuring positive lubrication of all reciprocating and moving contacting parts under all possible road conditions.

The spacious water jackets and oversized manifolds insure efficiency in the thermo-syphon



Partin-Palmer Light Weight Four-Cylinder Car, Model 32, with Five-Passenger Capacity.



Motor Generator and Silent Chain Employed in Partin-Palmer Starting System.

cooling system. There are water passages between the cylinders and around the valve cages, insuring uniform cooling. A large fan and a honeycomb radiator of large capacity afford radiation. The radiator is specially supported, so it is not subjected to strains or stresses that might be caused by the weaving of the frame.

The crankshaft bearings are $3\frac{1}{4}$ inches length and $1\frac{3}{4}$ inches diameter in front and $3\frac{15}{16}$ inches length and $1\frac{3}{4}$ inches diameter at the rear. The flange to which the flywheel is bolted is forged integral with the crankshaft. The connecting rod bearings are a split type $2\frac{3}{8}$ inches length and $1\frac{3}{4}$ inches diameter.

There are three main bearings supporting the camshaft, which is an inch in diameter. The timing gears are cut helically. The valves are $1\frac{3}{8}$ inches diameter, fitted with gray iron heads electrically welded to the steel stems. The pistons are perfectly balanced and are fitted with three rings. The piston pins are hollow and are ground to size. They are locked with set screws that are fastened with cotter pins. The upper end of each connecting rod is fitted with a bronze bushing.

The unit power plant includes a sliding gear transmission gearset that affords three forward speed ratios and reverse. The gears and shafts are of liberal size and annular ball bearings are fitted throughout. The ball type of gear shift is used.

Power is delivered to the

rear axle through a $1\frac{1}{4}$ -inch shaft that is completely enclosed in a torque tube supported at the forward end by a yoke, which is attached to the transmission gearset housing instead of to a cross member of the frame. A double universal joint is placed between the forward end of the propeller shaft and the transmission. Adjustable radius rods extend from the yoke to the rear axle.

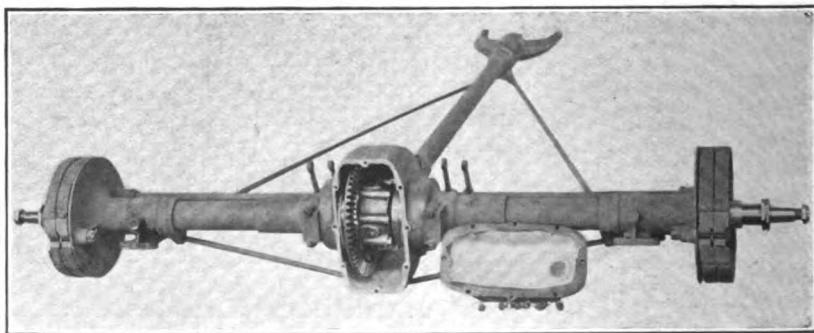
The rear axle is a full floating type with a gear reduction ratio of four to one. The drive shafts are $1\frac{1}{3}$ inches in diameter. The main bevel drive gear, the two differential bevels and the four differential pinions, are of liberal size and are double heat treated. Provision is made for lateral adjustment of the differential gearset without the necessity of removing the rear plate from the differential housing. The drive shafts turn on New Departure ball bearings.

Both brakes are internal expanding types and operate on liberal sized drums. The emergency brake is controlled by a hand lever and the service brake by the right foot pedal. The brakes are fitted with equalizers.

The rear springs are three-quarter elliptic and are hung underneath the axle, while the front springs are semi-elliptic. The wheels are an artillery type, fitted with demountable rims and straight side 32 by $3\frac{1}{2}$ -inch tires, of which the rear set is a non-skid type.

The channel section frame is pointed up in the rear and is tapered in front to obtain a short turning radius. The steering gear is an irreversible worm and sector type, fitted with a 17-inch wheel with spark and throttle levers above the spider. The I beam front axle is fitted with large steering knuckles and the spindles are provided with ball bearing. Car has 110 inches wheelbase.

In addition to model 32, Partin-Palmer cars built for 1916 include the model "38" six-passenger touring car, listing at \$975 completely equipped, and model 20 roadster listing at \$495.

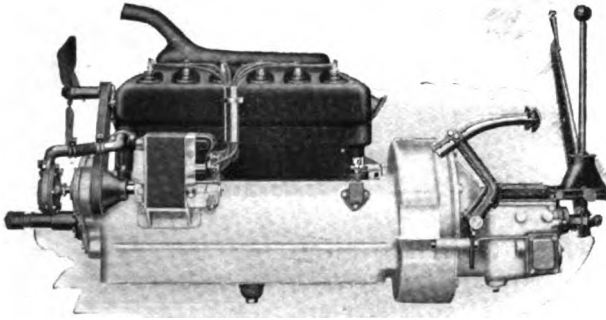


Partin-Palmer Rear Axle, Showing Supporting Yoke and Cover of Differential Removed to Show Components.

PILOT TO MAKE SIXES AND AN EIGHT.

Enters Market with an \$1100 Car and Announces That in the Future Factory Will Distribute Its Products Direct.

THREE six-cylinder and one eight-cylinder cars are now produced by the Pilot Motor Car Company of Richmond, Ind.—a “Six-Forty-



Six-Cylinder Power Plant of the Pilot Six-Fifty-Five.

Five” at \$1100, a “Six-Fifty-Five” at \$1685, and a “Six-Seventy-Five” at \$2485, and an “Eight-Fifty-Five” at \$1785.

The company has also inaugurated a new selling plan. In the past its cars have been marketed by the Pilot Car Sales Company. Hereafter the Pilot Motor Car Company will place its product direct through the medium of branch houses and distributors. George E. Seidel, president and general manager, has assumed active control of the company and Joseph W. Connor, formerly district sales manager of the Leyman-Buick

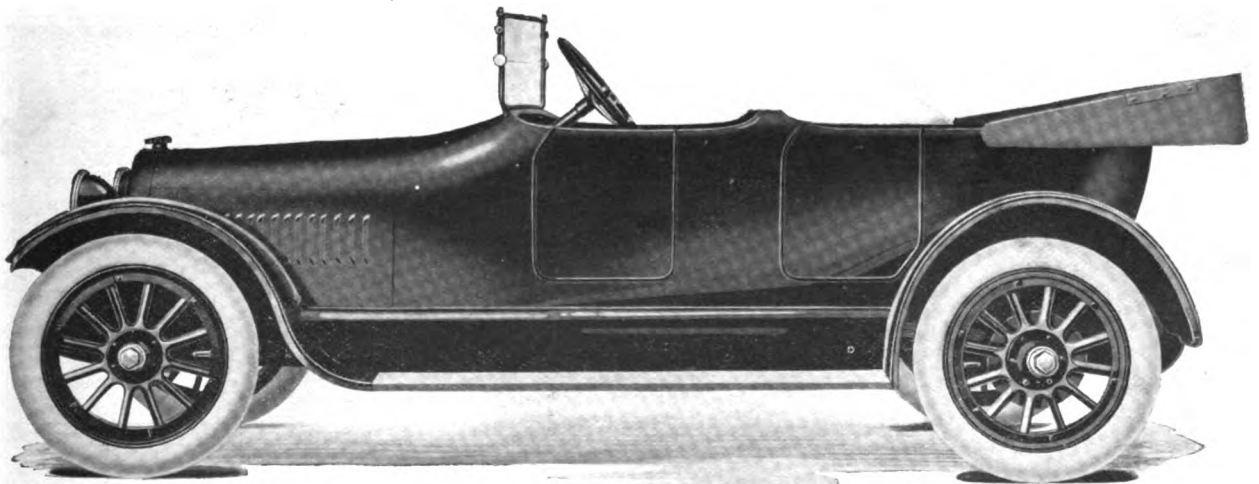
Company of Cincinnati, Buick distributor, has been appointed sales manager. A large number of new distributors have recently been appointed.

In producing the “Six-Forty-Five” the Pilot company enters a much lower priced field than it previously touched. The larger chassis are also reduced several hundred dollars in price. The “Eight-Fifty-Five” is a new car.

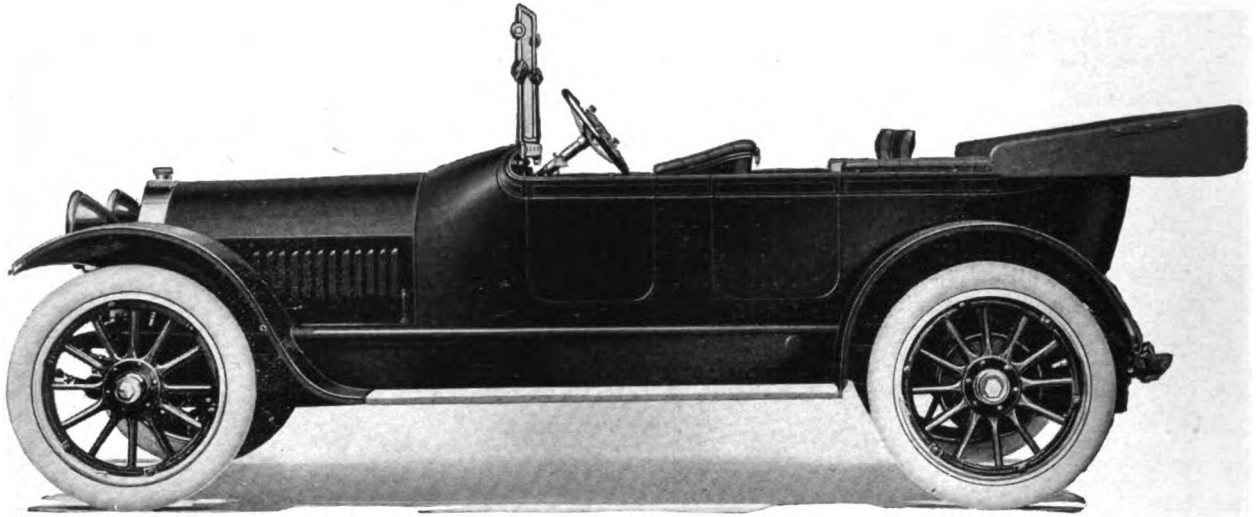
The Smallest Pilot Six.

The new Pilot Six-cylinder at \$1100 is built along much the same lines as the larger cars, the idea being to make it a smaller type of a very successful and well known machine. The motor is an L head type with cylinders having bore of three inches and stroke of five inches, with enclosed valves and removable cylinder heads. The cylinders are cast en bloc. The engine is in unit with the clutch and transmission gearset.

The lubrication system is patented, it being a combination splash and force feed. A pressure pump forces the oil through small ducts direct to the main bearings. In the lower half of the crank case are overflow oil basins and in the bottoms of the pans are drilled holes of a size to admit a given quantity of oil. In passing through the oil supply the lower end of each connecting rod keeps it in circulation. The faster the motor turns the more oil it receives. The supply is thus adjusted to the needs of the motor.



Pilot Model Six-Fifty-Five, the Six-Cylinder, Five-Passenger Touring Car.



Pilot Model Six-Seventy-Five, a Six-Cylinder, Seven-Passenger Touring Car.

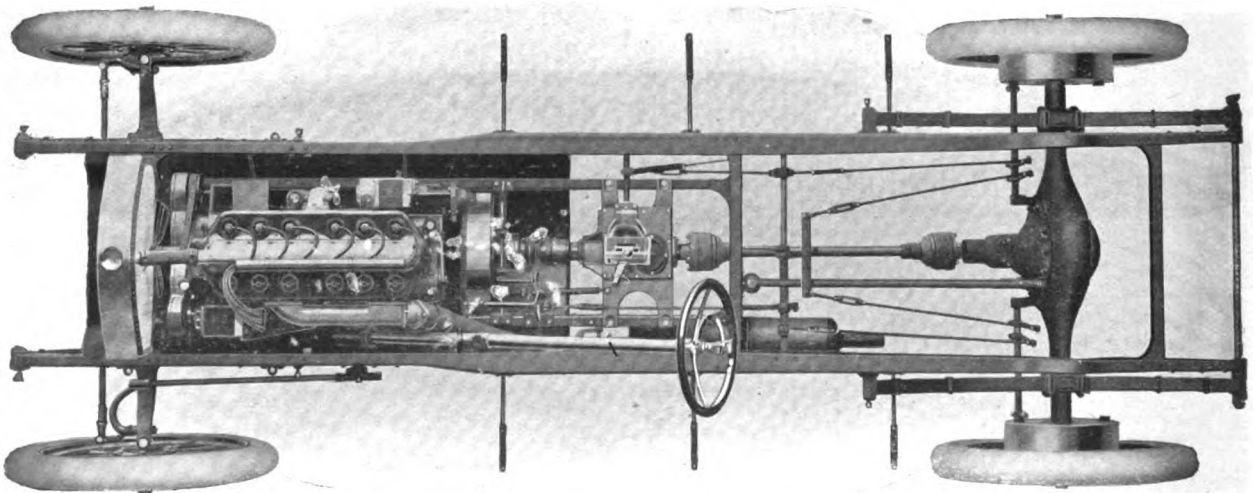
Water is circulated by a centrifugal pump through a honeycomb radiator and cooling is promoted by a pressed steel fan. The wheelbase of the car is 119 inches, which is unusually long for a five-passenger vehicle of this type, and ample room in the tonneau is afforded. The front springs are 36-inch half-elliptic and the rear springs are 52-inch cantilevers. The upholstery is exceptionally deep, being covered with genuine leather and padded with long drawn curled hair, supported on steel springs. The car is very well balanced and even at high speed it shows no tendency to weave.

The body is built on lines radically different from conventional and is a late type of centre cowl design. This results in a near approach to a pure streamline. Beginning at the radiator in

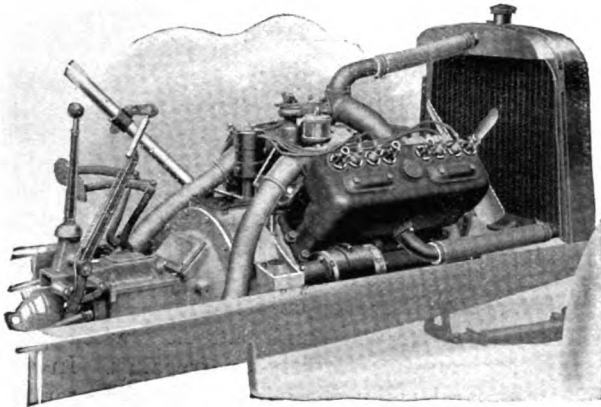
slightly oval shape it sweeps back to the dash cowl and then still with the same curves and unbroken lines to the centre cowl and thence to the broad back. A side view shows nothing of the back of the front seat except the centre cowl, in which it is absorbed.

Novel Four-Passenger Roadster.

Another attractive novelty in bodies is the four-seated "Get Chummy" roadster. This is a full streamline type and it accommodates two people comfortably in the rear seat—both in the body of the car and under the top. The front seats are individual, with an aisle between them, that gives easy access to the rear seat, which is built in a graceful curve. Whether the top is up or down this four-passenger car retains all the appearance of a two-passenger roadster.



Aeroplane View of the Pilot Model Six-Fifty-Five Chassis.



The Eight-Cylinder Power Plant of the Pilot Eight-Fifty-Five.

When the top is down, if desired, an addition to the slip cover pulls forward and is fastened to the front of the back seat, completely concealing the rear seat and protecting it from weather and dirt.

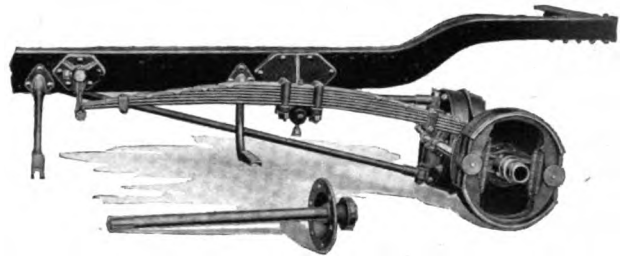
The standard finish of all Pilot models is Brewster green, with black metal parts. In the "Six-Forty-Five," as in the larger higher priced models, the purchaser's individual ideas as to color and finish are followed when this is desired. Buyers are urged to make their own selections so that each car may reflect one person's taste to the greatest possible extent.

High quality equipment is supplied throughout. The starting, lighting and ignition system is the latest Delco; the gasoline is fed by the Stewart vacuum system. A rain vision windshield has been designed to conform to the lines of the cowl. The top is one-man type, with quick adjustable curtains. The wheels are 32 by four inches, with non-skid Goodyear tires in the rear.

All instruments and switches are within easy reach.

The new Pilot eight-cylinder motor is of the usual V type, cast in two blocks. The cylinders have bore of three inches, with stroke of $5\frac{1}{8}$ inches, and have been especially designed to insure efficient cooling. The crank case is a special aluminum alloy, lessening the weight and adding greatly to the strength and durability. Easy access to camshafts and rocker arms is provided by a removable crank case top between the cylinder blocks.

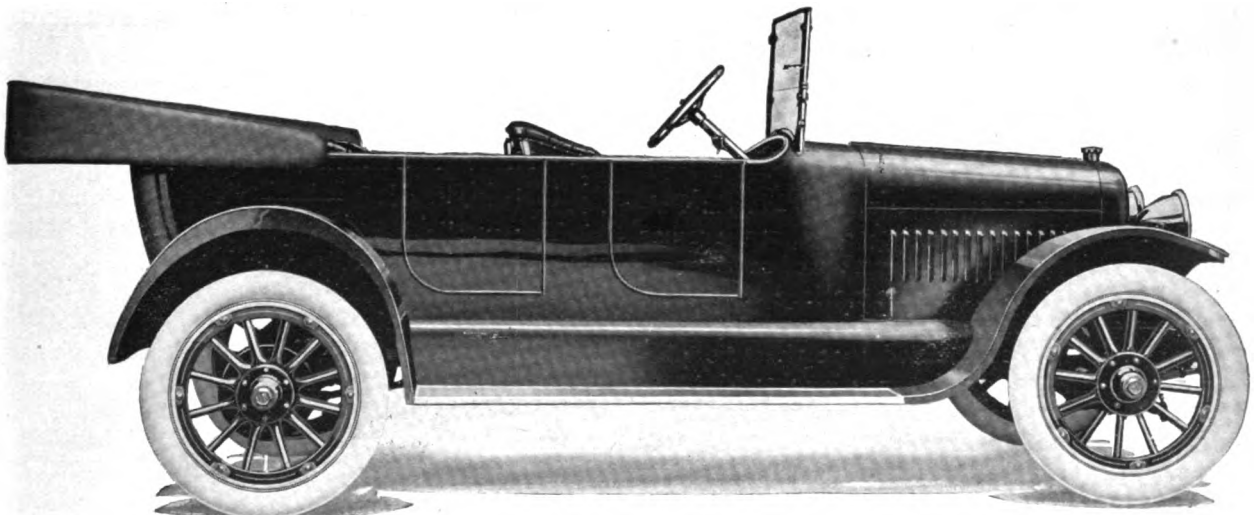
There is a single camshaft and all the cam



Rear Spring and Axle Assembly of the Pilot Model Six-Forty-Five.

operating mechanism is fully enclosed. The inlet and exhaust valves have a working diameter of $1\frac{1}{2}$ inches and are interchangeable. The valve stems and push rods work in separate, removable bushings. Removable plates cover the valve stems and push rods, keeping them free from grit. These plates are provided with openings to relieve crank case pressure. All push rods, valve stems and springs are lubricated by splash from the crank case.

The eight-cylinder cooling system is a thermo-syphon circulation through a large honey-comb radiator. The oiling system is a pressure

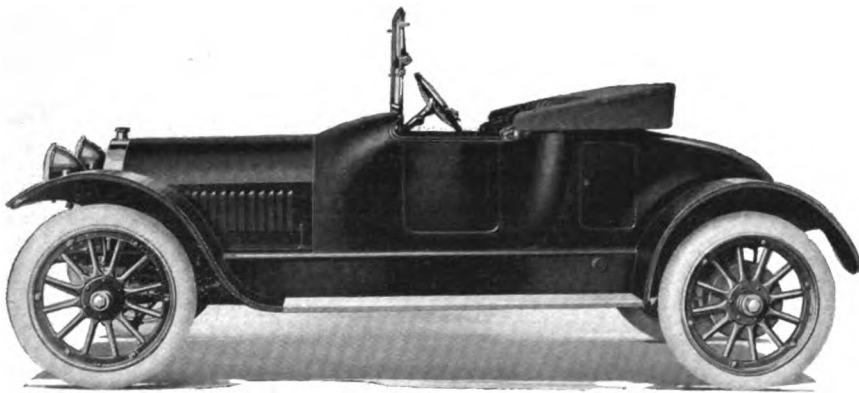


The Pilot Model Eight-Fifty-Five, the Eight-Cylinder, Five-Passenger Touring Car.

feed type to all bearings through a drilled crankshaft. The pistons and cylinders are lubricated by splash. The timing gears are positively fed by the pressure system.

Ease of riding is obtained by long 52-inch rear cantilever springs. The eight is furnished as a two-passenger roadster type and a five-passenger touring car, either having wheelbase of 126 inches. The bodies are streamline types and are finished in colors to suit the purchaser. Auxiliary seats, which will convert the car into a seven-passenger type, and oversize tires may be had at a slight additional expense. The equipment is similar to that of the other Pilot cars.

There has been no change in the other models. The "Six-Seventy-Five" has a T head motor cast en block with cylinder bore of $4\frac{1}{2}$ inches and stroke of six inches. The wheelbase is 132 inches. This model has been sold for \$2885, but this year it lists at \$2485.



The Pilot Model Six-Fifty-Five, Two-Passenger Roadster.

The "Six-Fifty-Five" has a T head motor with cylinders having $3\frac{7}{8}$ inches bore and $5\frac{1}{4}$ inches stroke. It develops in excess of 60 horsepower. Previously it sold for \$1885, but for 1916 it is listed at \$1685.

MOTORS INCREASE BATHING HE SAYS.

Assistant inspector of plumbing, Martin Palmer of Louisville, Ky., has noticed that there has been a great increase in the number of bath rooms in that town lately. He also noticed that there had been a great increase in the number of motor cars and he has decided that the two phenomena must have some connection.

After much investigation he discovered it. He says people want to die clean. When they step into a motor car they never know whether they are to return home or will end the journey at a hospital or at a morgue.

WATER FATAL TO ROADS.

It is water and not cold which damages roads in winter, according to the Department of Agriculture. When water turns to ice it expands, so that it occupies more space than it did as water. If a road is wet this expansion breaks it to pieces, so that when it thaws again it is soft and easily rutted. If this process is repeated several times during a winter the road may be ruined.

Dry roads, however cold it may be, will not heave. Rock gravel, sand and clay when perfectly dry contract slightly on freezing. In order to expand when they freeze these materials must be mixed with water. It is a mistaken idea that the thaw injures the roads—it is the presence of water at freezing time.

The remedy is to keep water off the road. The time to begin preventative measures is early in the fall, before the rains begin. If the road is thoroughly dry, with the surface drainage in good condition, the chances are very favorable that it will be in good shape in the spring. The ditches and drains should be kept open and weeds, grasses, etc., which tend to retain moisture and obstruct drainage, should be removed. When the fall rains and snows begin the road should be dragged often to keep it free from ruts and water. Ravelled places on macadam surfaces should be filled in and consolidated.

When a thaw comes in the winter cross drains and side ditches should be opened, and if the thaw is so pronounced that the roadway is softened the road should be dragged once or twice.

NEW CHALMERS IS POPULAR.

The public is showing much interest in the new Chalmers "6-30," according to the officials of the company, who also report many sales being made by dealers who have just placed the model on display. In New York City 14 cars were bought during the first five hours of exhibition. Consequently the six months' allotment of 1650 cars is expected to prove insufficient. Paul Smith, vice president of the company, in charge of selling, reports similar conditions from practically every part of the country.

ALCOHOL AS MOTOR FUEL IN EUROPE.

Agitations for Its Adoption Springing Up in Several Foreign Countries—Other Recent Developments Among Motorists Abroad.

ALCOHOL as a fuel for motor vehicles has again been revived in Europe and is receiving the serious consideration of foreign governments and individuals. France has made a definite move by declaring a government monopoly upon denatured alcohol, and will use it for industrial purposes. The decree becomes effective in 1917. Germans have for some time been mixing alcohol with benzol and using the mixture as fuel in gasoline motor vehicles and apparently with good results.

England probably would join in this tendency were it not for the restrictions upon its manufacture, which prevent any chance of it being done at prices that would make it readily saleable. Influential Britons are suggesting that the British government follow the step of the French, in which case all the alcohol needed within the empire could be produced at a price well below that of imported motor fuel.

Though the Russian government put the ban upon the manufacture and sale of alcohol for drinking purposes, it now is offering prizes ranging from \$2640 to \$39,650 for methods by which it can be used in industrial pursuits and as a fuel for motor vehicles.

British Motor Car Volunteers.

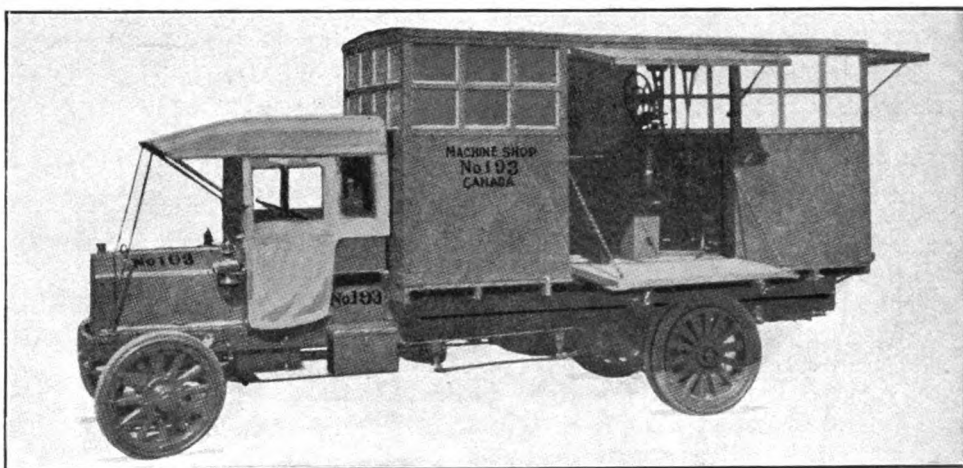
Agitation has been begun in England for the formation of a force of national motor car volunteers. Maj.-Gen. Donald MacIntyre, C. B., states the object as being to organize the motor car owners and motorcyclists into trained battalions ready to place themselves and their vehicles at the disposal of the regular, territorial or volunteer troops. The plan is to link up each county with the metropolis thereof, and the units are to

be arranged by county or city regimental organizations, which would be under the control of the commanders of such volunteer troop regiments. The principal duty would be scouting and transport service.

Ontario to Aid Roads.

For some time Canadians have been watching the progress of the good roads movement in the United States. The province of Ontario has now established a provincial roads department to extend aid to the local communities in road construction under a plan that is substantially similar to the state aid arrangements in this country.

The highway department will be under the di-



American Made Chassis, a Peerless Company Product, in Use in the European War as a Repair Shop with the Canadian Commands.

rection of a deputy commissioner under the minister of public works and highways. Three classes of roads will receive aid, township, county and main highways.

For the former, provincial aid will consist merely of encouragement and advice and aid in securing the most efficient form of organization. The province will pay 25 per cent. of the salary of a township road overseer for three years, provided the amount required is not more than \$600 annually.

On the county, or market roads the province will pay 40 per cent. of the cost of construction and 20 per cent. of the cost of maintenance. The

work will have to be done according to the highway department's specifications, and the aid cannot amount to more than \$4000 a mile. Such a road is authorized by a two-thirds vote of the county council and by a majority vote of the citizens.

The third type of road, or main highway, receives the same assistance as the county roads. The balance is assessed against the various municipalities along the route. A start can be made by petition of three-fourths of the municipalities interested. This legislation will be proclaimed and will become effective Jan. 1.

A long stone road, similar to the best of those laid by New York State, will be built to run from Ottawa to the border at the St. Lawrence river, connecting there by ferry with the New York State roads. The anticipated cost of construction is \$10,000 a mile, or \$600,000 in all. The province will pay \$240,000. The city of Ottawa, which will profit most by the road, will pay \$180,000, and the other municipalities on the route, \$180,000 between them. There is a struggle on as to whether the river terminus of the road is to be Prescott, Morrisburg or Cornwall. The influence of Prescott is expected to prevail. Ferry service to Ogdensburg, N. Y., at that point is excellent.

A first class road from Hamilton to Toronto is almost completed. If the new legislation leads to an extended good roads campaign in the province, it is likely that an improved road from Toronto to Montreal, along Lake Ontario and the St. Lawrence river, will be one of the first of such roads to be completed.

The United States consul suggests that United States makers of road building apparatus interested in the proposed road from Ottawa communicate with the department of public roads and highways at Toronto, Ont.

Japan Poor Motoring Country.

There is not much enthusiasm for the motor car or motorcycle in Japan. The total number of cars in that country is estimated at between 1500 and 1550, and their use is confined to Tokio and the so-called treaty parts of the immediate neighborhood. At present the owners are chiefly wealthy Japanese, or foreigners, or the public garages, of which there are a few in both the capital and the treaty territory.

Long excursions are impossible because the roads are too narrow. The demand so far has been chiefly supplied by American light car makers. The biggest year for importations was 1913, when \$302,505 worth of cars were imported. A falling off of 50 per cent. in imports was shown

in 1914. This was due in part to the war and in part to the fact that the market had been glutted.

Several taxi cab lines have started in Tokio, but with poor results. Motorcycles are being used by the middle class and this vehicle at present seems to have greater possibilities. There are probably less than 600 in use now.

Motor Cars in Honduras.

In the city of Tegucigalpa, Honduras, there are only 19 motor vehicles, including pleasure and commercial cars. These have been purchased within the last few months, since the opening of a motor highway. Indications are that the Hondurans are awakening to the possibilities of motor cars. The present administration is endeavoring to open up similar highways to reach every section of the Central American republic. The American consul there suggests that when these are accomplished there will be a spirited demand for cars, and that manufacturers should prepare themselves to secure this trade.

Cuba Rich Field for Cars.

Improvement of roads and great prosperity have combined to make Cuba at this time an attractive field for the sale of American motor cars. Low and medium priced cars are being bought very rapidly, while trucks are being used in larger numbers. Pleasure car sales by American makers in 1914 were \$254,428, while in 1915 they reached \$745,695.

FIND JITNEY BOOM OVER.

A report by a special committee of the American Electric Railway Association states that the jitney boom, which sprang up so rapidly last spring, has collapsed. It further states that the adoption of municipal regulations for the business has been largely responsible for the decline, although economic considerations had a great deal to do with it. Jitney ordinances have been passed in 112 cities, and in 60 cities there is a decrease in the jitney business from its highest point, ranging from 20 per cent. to complete discontinuance.

The committee's figures, however, do not indicate that the collapse is complete, since they show that in 52 cities the business is as highly developed as it ever was and that a 20, or even a 50, per cent. decrease in many towns would still leave a large number of jitneys in operation. The committee was continued in existence to study the use of 'buses of larger capacity than the small touring car and their use as feeders for electric lines, and to supply service and develop territory previous to the construction of electric lines.

PRACTICAL MOTOR CAR REPAIRS.

A LATHE is without doubt the most useful equipment of the garage, since it can be used for practically all machine operations. Fig.

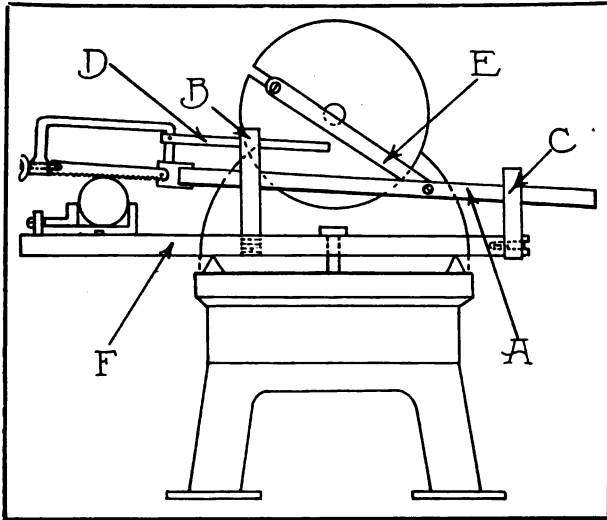


Fig. 113—How to Attach a Hacksaw to a Lathe for Power.

113 illustrates a power hacksaw attachment that can be used in connection with this machine.

It consists of the slide bar A, to which the hacksaw frame and blade is attached, and the guide bars B and C, that are securely fastened to the base piece F. The slide bar is worked backward and forward by the connecting rod E, attached to the face plate in the lathe. The small bar D is a guide to prevent the saw from turning.

The base plate F is a cast iron slab about one inch thick, eight inches wide and five feet long. When it is necessary to have the slab cast, the guides B and C can be made part of the pattern and cast integral.

The slide bar is a piece of steel about $\frac{3}{8}$ of an inch thick, two inches wide and four feet long, although the length may have to be varied according to the stroke. A hole is drilled in the centre of the bar for a $\frac{1}{2}$ -inch bolt, which forms the crank pin for the lower end of the connecting rod E.

The supports B and C are made of one-inch square ma-

chinery steel. The support or guide B is turned and threaded at the lower end to fit a $\frac{3}{4}$ -inch tapped hole in the cast iron base F. The other support C is attached in a similar manner at the end of the base as shown. Each support is slotted with a $\frac{3}{8}$ -inch hole, this being sufficient for a sliding fit between the slide and the sides of the guide.

The smaller guide D is made of $\frac{3}{8}$ by one-inch steel. One end is bolted to the saw frame, while the other end slides through the support B. The connecting rod E is a strip of steel $\frac{3}{8}$ -inch thick, two inches wide and of the proper length to suit the frame. It is drilled at both ends to receive $\frac{1}{2}$ -inch bolts, so that it can be attached to the face plate at the upper end and to the slide bar at the lower end.

The stroke of the saw may be varied by moving the upper bolt to any position in the slot. The equipment is completed by attaching an ordinary drill vise at the end of the base plate.

REPAIR OF CIRCULATION PUMP.

Overheating is frequently the result of an inefficient water pump. It is obvious that when the blades of the impeller wheel become badly worn the proper remedy is to replace the wheel with a new one. At Fig. 114 A is shown the type of pump referred to. When a new wheel is not available a suitable repair can be made as follows: Cut strips which are of the same length and a trifle wider than the blades from a sheet of

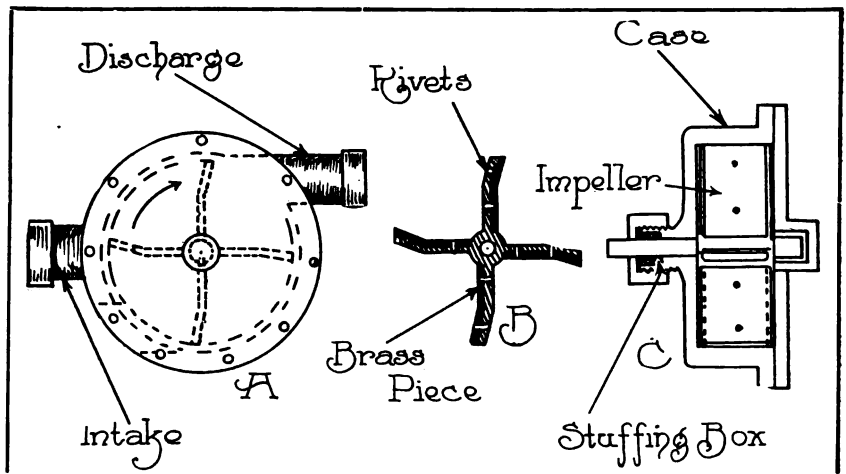


Fig. 114—A, Constructional Details of the Water Pump Under Discussion; B, How Propeller Blades Should Be Repaired; C, Shows How Blades Should Fit.

brass. These should be riveted to the front of the blades, as at B, and shaped accordingly. When the wheel is refitted to the shaft it should be turned by hand to determine that there is no binding. An easier fit can be had by filing the sides of the brass strips. Fig. C illustrates the assembly of the pump when the strips are attached.

HOME-MADE SPARK PLUG TESTER.

Locating the missing spark plug is not always an easy task, especially when the motor is not equipped with relief cocks. A simple device for testing spark plugs and one which will positively guard the workman against shocks is shown in Fig. 115 A. The metal pieces can be made of sheet stock, which should be about 1/16 of an inch in thickness and a half-inch in width. The

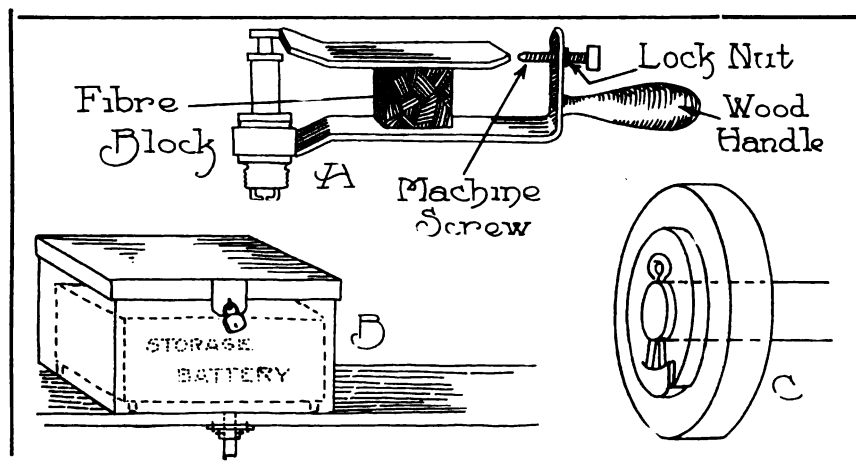


Fig. 115—A, Simple Spark Plug Tester; B, Providing Drainage for the Battery Box; C, How to Prevent Cotter Pins from Becoming Worn.

pieces can then be shaped and bent as shown and connected by a fibre block. The longer metal piece should be drilled and tapped near the end to take a small machine screw. A small nut is first run on the screw to serve as a lock. A wooden handle should then be attached as shown. Its operation is simple. The two metal strips are placed in contact with the shell and the terminal of the plug and the current passes to and across the adjustable gap.

DRAINAGE FOR BATTERY BOX.

A well designed battery box has some provision for drainage, as frequently some of the electrolyte escapes the baffle plates and if it cannot immediately escape from the bottom of the box, it has a very deteriorating effect upon the wood. If drainage is not provided for, the simple ar-

range ment shown in Fig. 115B will prove effective. Drill a 1/2-inch hole through the battery box and running board and insert a short length of 1/2-inch pipe until it is just flush with the box. Fasten a flange over the pipe and make secure by two or more set screws. Wood screws can be used to bind the flange to the running board. It is well to place small supports under the battery so that it will keep it dry and not impede drainage. A box designed in this manner can be frequently washed.

HANDY STORAGE CABINET.

The systematic replacement of tools, materials, etc., so that they may be readily found when again required is an essential feature in every garage, either public or private, that pretends to orderliness. The storage cabinet illus-

trated at Fig. 116 A is easily made for that purpose and provides an excellent repository for small articles. It can be made cheaply or can be built for ornamentation. The cigar smoker could make the drawers out of the boxes in which his cigars come, preferably those that hold 50 cigars. Of course, the covers should be removed. The frame work of the cabinet should be provided with partitions and slides on which the drawers are to rest, in the same way that card index cabinets are made. Handles for the drawers can be ob-

tained of any hardware dealer at a reasonable cost, or pieces of leather can be tacked on to serve the same purpose. Of course, each drawer should be labelled according to its contents.

PREVENTING COTTER FROM WEARING.

Cotter pins are often used, and especially on earlier types of machines, for retaining small revolving parts. An objection to this practise is that a washer placed between a pin and a revolving part will frequently revolve with the part and quickly wear the pin. This form of wear can be prevented by the means illustrated at Fig. 115C. The washer is cut as shown about 1/2-inch along its circumference. This piece is raised and the cotter pin placed under. Then the raised part of the washer can be pressed against the pin. In operation, the washer cannot turn.

HANDY DRILL BLOCK.

Small drills are frequently lost if not placed in some designated place after using. Fig. 116B

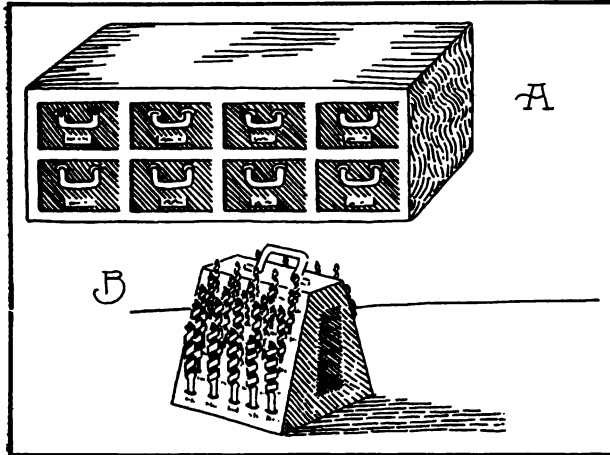


Fig. 116—A, a Simple Cabinet for Storing Tools and Materials; B, a Means for Keeping Various Sized Drills in Proper Order.

shows an easily constructed block for this purpose. Saw a 12-inch square hard wood block to form two opposing sides at an angle, as shown. Holes which have diameters corresponding to those of the drills can then be made in the sides. It is obvious that the drills are always accessible and the repair man can see at a glance if any are missing. The diameter of the drill can be marked in the front of each hole. The remaining sides of the block can be used as a reference table, showing decimal equivalents, tap drills, body drills, etc. The block can be set on the work bench, or can be carried by a handle attached to the top.

THIN OIL THAT WILL NOT THICKEN.

Numerous parts of the car require a high-grade, light oil. When this is bought in small bottles, the expense is great. A good oil for this purpose can be made by taking a bottle that is about three-quarters full of good quality olive oil and dropping several strips of sheet lead and exposing it to the sun for three or four weeks. The light oil will rise and this should be drained off.

BABBITTING BEARINGS.

Repair men specializing on one make of car can save much time in babbitting connecting rods if they will use a jig similar to the one shown in Fig. 117. The hollow mandrel, which can be turned in the lathe from a piece of steel tubing,

should be slightly less in diameter than the journals of the crankshaft, and its surface should be perfectly smooth. Two collars should be fitted snugly over the mandrel and retained by set screws, as shown. They should also be recessed so as to just fit over the outside of the rod bearing. By this arrangement the true relationship of the rod with the shaft is assured when it is placed on the mandrel and clamped between the collars. Vent holes should be provided for the escape of the heated gasses by cutting grooves in the face of each collar nearest the large end and on the same side as the hole through which the metal is poured. In babbitting, the lower cap of the rod bearing should be removed and the upper half treated first. Liners should then be placed between the two halves to prevent the molten metal from coming in contact with that which has already set, and also to allow adjustment of the rod. The sketch at the right illustrates the correct method of pouring. One advantage of the use of a hollow mandrel is that a heated piece of iron or steel can be inserted to heat the place to be babbitted, and another advantage is that the work can be cooled quickly by running water through the mandrel. Two V blocks to support the work on the lathe's bed will be found convenient.

REPAIRING BROKEN SPRING.

When two or more leaves of a spring break, it is not good practise to insert new leaves without first having the remaining leaves reset. When springs have been in service for a considerable period, they gradually settle. Consequently, the new leaves will not fit properly with old leaves and another broken spring would be the result.

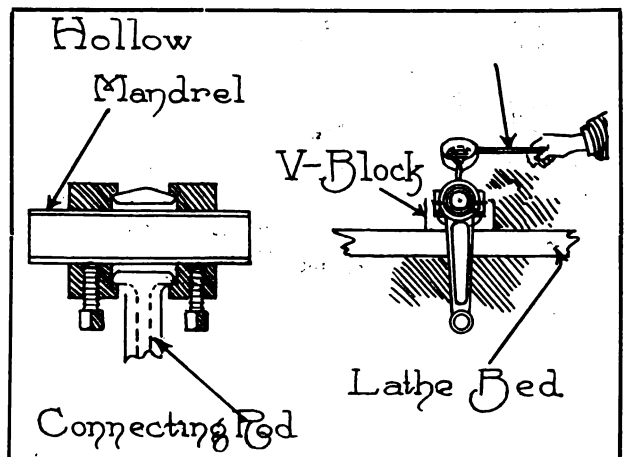


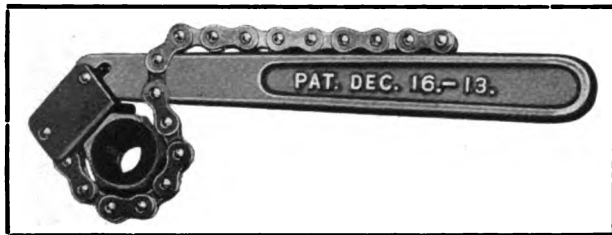
Fig. 117—How to Construct a Hollow Mandrel for Babbitting Bearings.

CAR ACCESSORIES AND EQUIPMENT.

RIESENBERG'S ADJUSTABLE WRENCH.

Easily Adjusted Wrench Adaptable to All Objects Regardless of Shape—Tighter the Pull, Tighter It Grips.

The Riesenbergs' patented adjustable wrench, illustrated herewith and marketed by Frederick A. Watkins, 565 W. Washington street, Chicago, Ill., is designed to do the work of ordinary and Stilsen wrenches. It consists of a drop forged all-steel handle, at the end of which is a movable jaw or gripping piece. Attached to this piece is a flexible linked steel chain of great strength. The chain is passed around the article to be gripped and the link placed in the slot which holds the chain tightest around the object. It is obvious that pressure on the handle causes the movable jaw to tighten



Riesenberg's Patented Adjustable Wrench.

and thus the chain grips the object in a vise like hold. The wrench is six inches in length and can be conveniently carried in the pocket or tool chest. It can be used on any object measuring from $\frac{1}{4}$ inch to $2\frac{1}{4}$ inches.

HEALY VALVE GRINDING SET.

It Includes a Spring Compressor and a Valve Grinder, Which Is Equipped with a Universal Joint and Spanner.

The Healy Tool and Appliance Company, 62-64 Pearl street, Buffalo, N. Y., is manufacturing the Healy universal valve grinding set, which is shown in the accompanying illustration. It consists of a valve remover, universal valve grinder and two cans of Speed-E valve grinding compound. The remover compresses the valve spring and holds it until the valve is removed. A small lever furnished with the set engages the holes in the



The Complete Healy Valve Grinding Outfit.

frame of the tool. A downward pressure on the lever raises the spring plate, which automatically locks. The universal grinder is equipped with a universal joint, so as to enable the operator to work at any angle and also to reach inaccessible valves, and a spring at the centre affords equal pressure on all sides. The important feature of this tool is that the spanner is adjustable and will, therefore, fit any size valve. The outfit retails for \$2.

COLLAPSIBLE PAIL AND FUNNEL.

Useful Article That Can Be Carried in a Small Space Under a Seat or Cushion.

The National Manufacturing Company, Des Moines, Ia., has placed on the market the Faultless collapsible automobile pail and funnel, which has a capacity for five

quarts of water. When not in use it can be folded and carried under the seat or cushion. The pail is made from the best heavy water proof army duck, with a galvanized hoop at the top and a non-rustable valve at the bottom. The water can be instantly released through the valve by pulling a string attached to the handle. This prevents spilling when the radiator is being filled. When collapsed it is as flat as a dinner plate and can be tucked away in almost any part of the car. It opens by its own weight and is instantly ready for service. The pail and funnel can be had from most dealers or direct from the factory for \$1.



Faultless Pail Open and Closed.

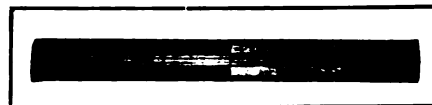
CARTER'S SPARK PLUG DETECTOR.

Instrument Which Quickly Shows Whether Plugs Are Firing or Missing, Without Removing Them.

The Carter spark plug detector, illustrated herewith and manufactured by the Carter Spark Plug Company, Detroit, Mich., is a mechanical device for detecting

whether the spark plugs are firing or missing. It is very simple in operation and the most inexperienced person can determine the condition of the plugs as quickly as the most skilled mechanic. It is unnecessary to remove the plugs from the motor. To operate simply place the detector against the metal part of the plug below the porcelain. This test can be conducted while the motor is running or within 10 minutes after it is shut off. In the latter case the detector registers the temperature inside the cylinders, through their respective plugs.

This instrument enables one to get at the root of motor troubles by first proving the working of the spark plugs. Short circuited or fouled plugs can be located almost instantly, and by first verifying the ignition, tampering with the carburetor is prevented. The detector retails at \$1.50.

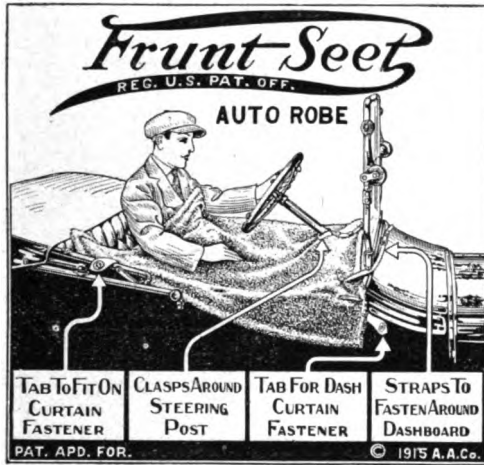


Carter's Spark Plug Detector.

FRUNT-SEET AUTO ROBE.

Robe Which Fully Protects Occupants of Front Seat, but Does Not Hamper Operation of Car.

The Frunt-Seet auto robe, manufactured by the Automobile Apparel Company, Port Chester, N. Y., and illustrated herewith, is designed to protect the passengers riding in the front seat of the car from the cold. The robe fastens on the dashboard at the bottom of the windshield and to the sides of the car. A special flap fits around the steering wheel post. The robe rests firm and flush across the frame of the car, lapping over all sides.



A Cold Weather Necessity for Operators of Open Cars.

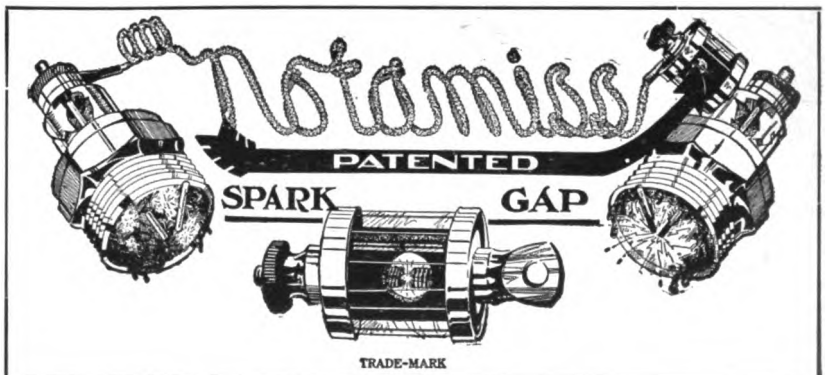
It is of ample length to reach from the dash board to the chests of the passengers, and retains the heat generated by the engine and in the front compartment. The robes are made in six styles, three of the universal size and three of the Ford car size. Style No. 1 is designed to fit all cars, including the new model Fords. It is made of black or green plush, with a heavy cloth lining and is reversible to fit the right or left hand drive. This robe retails at \$6.50. The other styles range in price from \$3.75 to \$5.

THE NOTAMISS SPARK GAP.

Device Attaches to Plug and Is Designed to Produce a Hot Spark Under All Conditions.

A device which is said to improve the operation of most spark plugs, and thereby increase the efficiency of ignition, is sold by the Notamiss Spark Gap Company, 710 Mulberry street, Des Moines, Ia. Even broken insulation or badly sooted points do not interfere with good ignition when this device is in use, its makers declare.

The principle is the same as that used in wireless telegraphy—namely, that if a current is once compelled to jump a gap it will seek the next gap and jump it even though there is an easier way of escaping. The Notamiss gap consists of a paper fiber cylinder which has two brass screws inserted from opposite ends. A horizontal hole through the centre of the cylinder allows a clear vision of the working parts. The fiber is encased in a cylindrical glass, the ends of which and the fiber are covered by brass caps. The ends of the screws are exposed, one being pierced on the outer end for attaching to the spark plug, while the other screw has a set nut to permit adjustment. The device is claimed to make it unnecessary to use master vibrators on the Ford car. The Notamiss spark gap costs 75 cents.

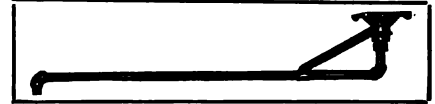


A Device Designed to Produce a Hot Spark Under All Conditions.

AUTOMOBILE WASHER.

Equipment Having a Circular, Swinging Movement, Directs Stream to Each Part of the Car.

The Walworth Manufacturing Company, Boston, Mass., widely known as a wrench manufacturer, is marketing the automobile washer shown in the accompanying illustration. The apparatus attaches to the ceiling by four lag screws, which are supplied, and the water supply pipe leads from the washer along the ceiling and down the wall to the main supply. The hose arm, which is strongly constructed and securely braced, is so designed as to have a circular, swinging movement within an area every part of a car can be reached. The equipment is brass and the remainder of heavily galvanized wrought and cast iron.



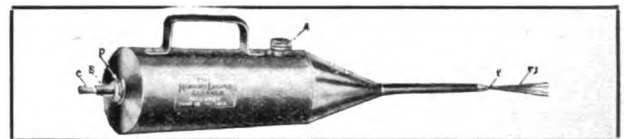
Swinging Automobile Washer.

When a 15-foot length of hose is attached to the arm every part of a car can be reached. The equipment is listed at \$10 and the company will supply 15 feet of 3/4-inch, three-ply hose, complete with necessary couplings, for the additional sum of \$2.50. A 3/4-inch self closing spray nozzle can also be purchased at \$1.10.

ROMORT ENGINE CLEANER.

Equipment Which by Combining Air and Fluid Produces a Fine Spray with Which to Clean the Engine.

Grease, oil and dirt on the motor of the machine may be easily removed by the Romort engine cleaner, which is illustrated herewith and is manufactured by the Zinke Company, 1322-26 Michigan avenue, Chicago, Ill. It is constructed on scientific principles. The air does not enter the tank, but passes through the air tube and mingles with the fluid at the extreme end of the cleaner.



Romort Engine Cleaner.

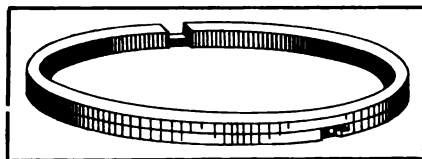
This construction positively eliminates possibility of explosion.

The long spout enables the operator to reach every part of the machinery. The tank has a fluid capacity of two quarts, which is considered sufficient to clean the largest engine. Air may be supplied from any type of system that produces pressure ranging from 20 to 200 pounds. The manufacturer recommends the use of common coal oil for cleaning purposes. The retail price of the cleaner is \$3.

RANDERSON AUTOMATIC PISTON RING.

Two-Part Ring, Which Expands According to Pressure of Compression—Only One Ring to a Cylinder Required.

The Randerson automatic piston ring, shown in the accompanying illustration, and manufactured by the Du Bois Machine Shop, 118 Hudson avenue, Albany, N. Y., is guaranteed to be absolutely compression tight. This is accomplished by the ring being formed of two separate parts, fitted one around the other. The L or



Randerson Automatic Piston Ring.

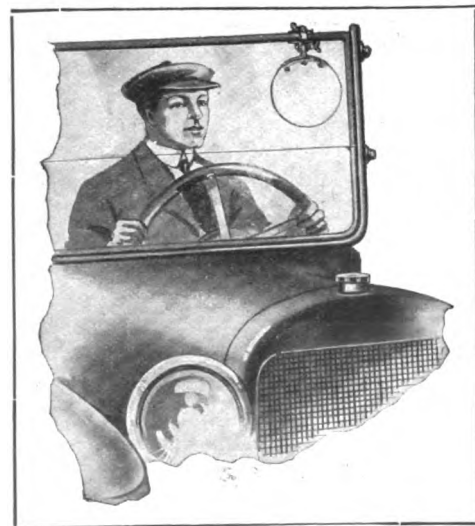
bull ring conforms to the full width of the groove. The section is completed by a snap ring. There is but one opening and that is at the top. The ring is so designed that regardless of the width of the slot, it is impossible for compression to leak by. The pressure reaches the inside of the ring and automatically seats and expands it. The manufacturer declares that the ring is so absolutely compression tight that perfect compression and complete combustion can be obtained by the use of only one Randerson automatic piston ring in each cylinder. This should be placed at the head of each piston, which eliminates the friction and wear due to the use of numerous rings. This also lightens the weight of the piston.

The rings are carefully molded in the company's own foundry. Each section is of individual casting, the metal being a tough close grain gray iron. The turning and grinding is done by special machinery, after which each ring is carefully tested.

STAUDE GLARE STOPPER.

Amber Colored Lens Which Eliminates Glare from Strong Headlights.

Although almost universal agitation has been instituted against the practise of using glaring headlights, there are many instances wherein the practise still prevails. If not in the cities, it is so in country districts. Even if the laws are rigidly enforced and obeyed, there are still the rays of the sun to contend with.



How Staude Glare Stopper Is Attached to a Car.

and to be located on the windshield directly in line of the driver's vision. The glare stopper is made of amber glass, which will dissect the harmful rays and leave the vision clear even in the strongest glare. It measures about seven inches in diameter and is mounted on a special design jointed arm, which holds the glass in the correct position regardless of the angle at which the wind-

The E. G. Staude Manufacturing Company, 2675 University avenue, St. Paul, Minn., is offering the Staude glare stopper, which is a device designed to eliminate all glare

shield may be turned. It can be attached to either side of the windshield or suspended from the top, and is prevented from rattling by the use of a thumb screw, by which it is attached.

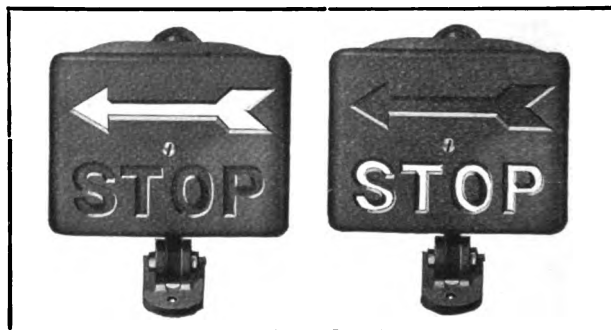
The retail price is \$2.50. New lens can be bought for \$1.25 each.

MOTO-LITE SIGNALS.

Signals Which Indicate to the Driver Behind the Direction in Which the Car Ahead Is to Turn.

The custom of extending the hand from the side of the car when a driver is to stop or to turn a corner has become almost universal. While in some circumstances this method answers all requirements, there are times, particularly at night, when the system fails.

The Ona-Moto-Lite Company, 30 Euclid arcade, Cleveland, O., is marketing the Moto-Lite safety signals, which are shown in the accompanying illustration. They are furnished in sets consisting of one for the rear fender, or other convenient position at the rear, and one for the front fender or the radiator cap. Operation is from any electric current, and the consumption is negligible.



Moto-Lite Signals.

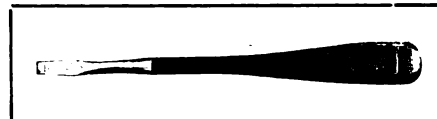
The signal on the front of the car, which is a duplicate of the one in the rear, serves as a pilot light. When the driver operates the controlling bulb and switch, which is encased in a round, black enamel receptacle, the front signal lights simultaneously with that in the rear. The light shines through a milk white bullseye mounted in German silver and thus enables the operator to determine if the signals are operating satisfactorily.

The signals are simple and easily understood. A turn to the left is indicated by the illumination of the green glass arrow, and a turn to the right or a full stop by illumination of the red glass "stop" signal. The price of the set complete is \$6.50.

SCREW DRIVER HAS RUBBER HANDLE.

Tool Sheathed in Rubber Affords Protection for the Workman When a Current of Electricity Is Present.

The screw driver illustrated herewith is manufactured by H. D. Smith & Co., Plantsville, Conn. It is designed for use on automobile, gas and electric motors and for general purposes, and is especially adapted for use on electrical apparatus. The rubber completely covers the handle and shank and tapers down to the blade. This construction eliminates shoulders, affords free manipulation at all times and provides a very firm grip. The blade is made of steel and is absolutely guaranteed. The screw driver is listed as No. 613 and measures 11¼ inches over all. The list price is \$9 per dozen.



Screw Driver Provided with Rubber Covered Handle.

SUGGESTIONS FOR THE FORD CAR OWNER.

The Steering Column and the Linkage Connecting It with the Front Wheel Spindles —the Planetary Type Reduction Gearset—Construction of the Muffler.

The 37th article dealing with the construction, operation, maintenance, care and repair of the model T Ford chassis is devoted to a consideration of the steering gear, including the linkage from the front axle to the steering column, and its connections, and the means of silencing the noise of the explosion of the engine.

STEERING the car as generally referred to is turning of the front wheels so as to direct the movement of the machine, and this is done by the swinging of a hand wheel fixed on the top of a rod that is connected with the linkage coupling the forward wheels, so that they may be moved from left to right or right to left from maximum to maximum or any degree between.

One of the essentials of an efficient steering gear is that it shall be sensitive—that is, that a very slight movement of the hand wheel shall be sufficient to vary the course of the vehicle, and the connections should be such that there is no lost motion between the wheels and the steering column, so that there will be no uncertainty of the driver as to the degree of variance from a perfectly direct line that any movement of the hand wheel will cause.

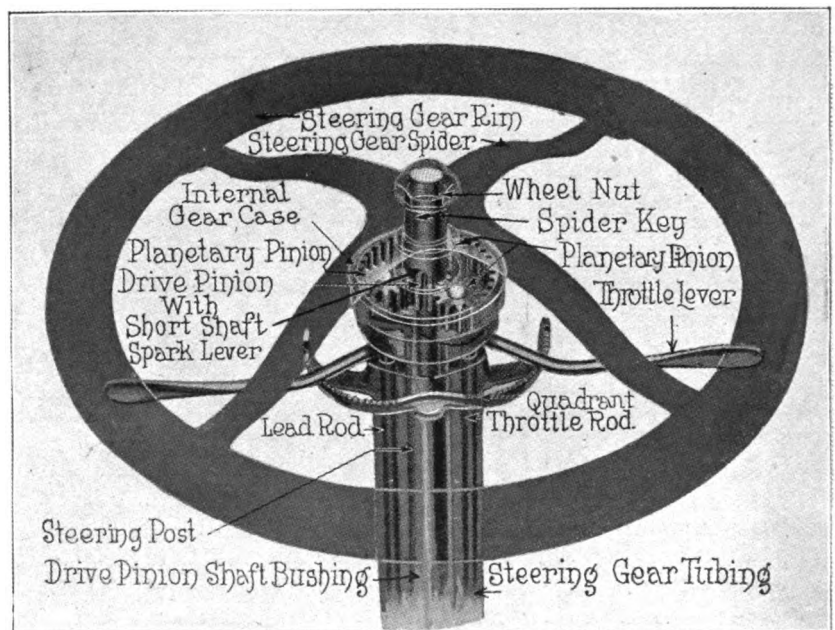
The steering gear must have sufficient leverage so that the vehicle can be steered without material exertion by the driver, and it must be so constructed that the wheels can be held rigidly in the direction they are moving, despite the shocks of striking road obstructions or the inequalities of the surface over which they are being driven.

Both Radial and End Thrust Loads.

One must understand that there are very severe strains upon the steering wheels. While they are not driven by power in the same sense as the rear wheels, and are free to turn upon the axle spindles, whenever they are not in a perfectly straight line, they are subjected to the twisting stresses of turning them, as well as the

end thrust upon the axle spindles from the contact of the wheels with the road surface and when the vehicle is being driven upon a crowned way, so that one wheel is lower than the other.

When the wheels are correctly adjusted upon the axle spindles they will turn freely—so freely that the weight of the valve stems of the tire tubes will cause the wheels to revolve until these stresses will be at the lowest points when the wheels are off the ground—and yet there ought to be no side movement of the wheels upon the bearings. By this is meant that if the wheels



Phantom View Showing the Design and Construction of the Head of the Steering Column of the Ford Chassis.

are jacked and the spokes are grasped with the hand near the ends, the hubs should be so well fitting that there will be no play on the bearings at the hub. So long as this relation obtains the wear upon the bearings will be minimum and there will be no lost motion in the wheels. Obviously, any play at the wheel bearings will in turn affect the steering pivots, because there will be undue leverage upon them, and this in turn will be carried through the lever arms to the tie rod and thence to the drag link and to the steer-

ing column and the hand steering wheel.

While slight play may not appear to be serious, yet when one considers that movement may be multiplied at each point of wear, the aggregate may be considerable, and unless adjustment is made to compensate it there will not only be deterioration, but unnecessary and objectionable noise.

Effects of Vibrating Stresses.

Few persons ever really understand the conditions of wear that must be endured by automobile construction. The vehicle is necessarily made as light as it may be practically built, and one of the necessary factors for reducing wear is to have the contacting surfaces of the bearings or joints as large as the design will permit. The best preservative that can be conceived is adequate lubrication, and the main factor of attention aside from affording sufficient lubricity is

hub flanges are set tight with bolts that draw them against the spokes, and despite the leverage of the end thrust against the sides of the wheels, there is rarely, if ever, occasion to tighten these bolts. But wherever metal contacts with metal there is more or less wear, especially if there is not continuous and sufficient lubrication. The wheel bearings are subjected to extremes in the point of use, for no matter whether the movement of the vehicle be forward or back the wheels must turn, and besides the direct load there is the end thrust.

The direct load may not be greatly changed, but the end thrust is greatly varied, for increase is with the square of the speed. That is, there is four times the end thrust stress when the vehicle is moving at the rate of 20 miles an hour as there was at a speed of 10 miles an hour. This ratio is maintained through all of the speed variations

from zero to a maximum, and the faster the average speed of the machine the greater will be the average stress upon the vehicle construction.

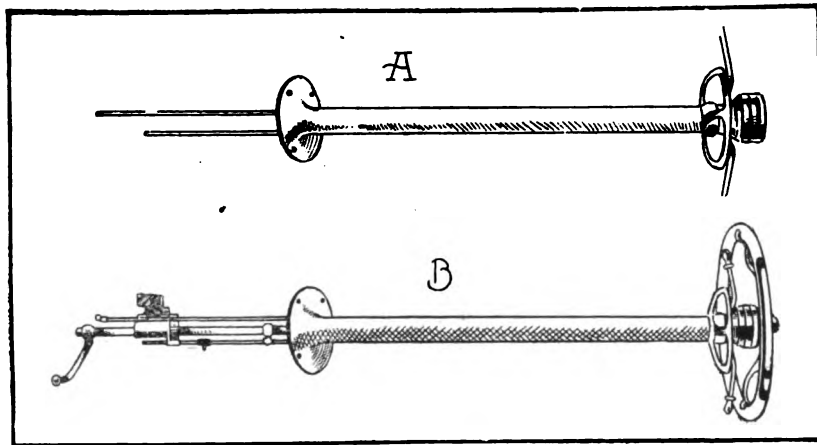
The reader understands that the ball bearings of the wheels can be very closely adjusted, so that practically correct relations can be maintained at all times, but the pivots of the steering knuckles, on which the wheel spindles and the wheels are swung, have plain bearings or bushings, through which the bolts are passed and secured by nuts. These bushings are long

and are steel, and if properly lubricated should endure a considerable length of time. They can be renewed when necessary, but when worn there will be some play that will be manifested to the owner when the wheels are jacked.

Steering Arms and Connections.

The steering arms of the knuckles are separate drop forgings that are fitted into eyes of the spindle bodies, so-called, and secured by heavy nuts, and in the ends are eyes. The arms are slightly curved, so that the ends are nearer together than are the seats in the spindles, and the ends are connected with the tie rod, which is fitted with yoked ends that are secured by bolts. On the tie rod at the right end is a ball-ended lug or bracket that is, when the tie rod is installed, in a horizontal position.

The drag link or steering gear connecting rod is a straight section of metal that has at one end



The Ford Steering Column; A, the Tube That Encloses the Post and the Control Rods; B, the Complete Assembly.

thorough adjustment at all points of wear.

The metal construction of an automobile chassis is imperative to obtain strength, but this is susceptible to vibratory stresses, which are communicated through the structure, being somewhat influenced by the character of the metal and its proportions, and wherever there are joints the vibrations have the effect of loosening the means of fastening. The wheels are shod with pneumatic tires that materially cushion the road shocks, and between the axles and the frame are the springs that are expected to absorb a considerable part of what are communicated through the wheels and axles, while the passengers are seated on spring cushioned upholstery to further protect them.

Wood Will Greatly Absorb Vibration.

Wood will absorb vibrations to a marked degree, and this is illustrated in the wheels. The

a socket formed by a bolt secured cap that is fitted over the ball ended bracket, and the other end has a socket formed by a cap secured by two bolts that is fitted over the ball at the end of a steering gear ball arm that is held firmly by a nut at the lower end of the steering column. The balls may be turned freely in the sockets, but when first fitted there is comparatively little play. These sockets may be adjusted so that the fits will be close when necessary to compensate wear.

The Steering Column Housing.

The steering column consists primarily of a long metal rod that is enclosed in a tube or housing, and this housing is fitted at the base with a bracket that is formed to be bolted to the dash that forms the front of the compartment ahead of the front seat. The tube does not extend the full length of the rod. The lower end of the rod is mounted in a bracket that is secured to the frame so that it is held rigidly, and leverage may be exerted upon it without springing it. The tube is of such diameter that the steering column will not contact with it and free movement is at all times a certainty. The steering column is installed at an angle that will bring the hand wheel within convenient reach of the driver, and yet it is made as short as is practical to insure the greatest degree of rigidity.

At the top of the steering column the hand wheel is mounted. This is built with a metal spider or hub and four spokes that are at angles of 90 degrees on centres, and to the ends of these spokes the rim, which is an oval section, is secured. The wheel spokes are flat and thin to afford the greatest strength in the direction of the force exerted upon them. By turning this wheel in either direction the metal rod is turned so as to swing the steering gear connecting rod and the tie rod transversely under the chassis frame.

Need of a Reduction Gear.

Were the hand wheel directly attached to the rod there would be too great strain upon the wheel and holding it would be difficult even for a very strong driver when the machine was driven fast, and there is probability that with such construction contact with an obstruction would wrench the wheel from the driver's hands. In most steering gears the hand wheels turn the steering column. There are several forms of reduction gearing used by which the wheels can be turned greater degrees than the arms that swing the drag links, all these being located at the bases of the tubes, and generally close the lower bracket to obtain the fullest rigidity.

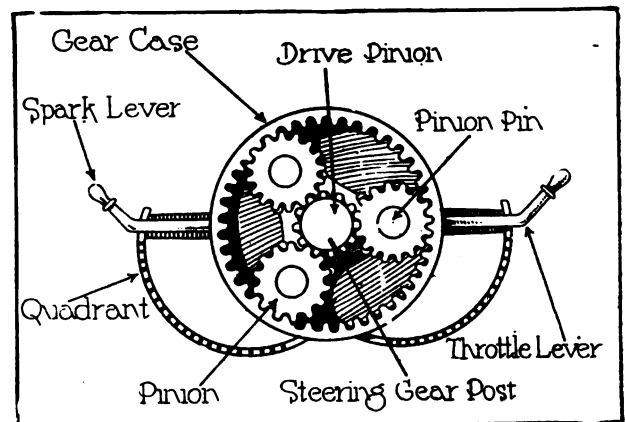
The steering column of the Ford chassis,

which is patented and is found only in these machines, is what is known as an epicyclic or planetary type, and the reduction gear is at the top of the column. The top end of the steering rod carries a triangular flange at right angles to the shaft or rod, and on each of these points of the flange is a lug or stub that is the shaft that carries a small spur pinion.

Is a Planetary Type.

Into the centre of the rod, centred between the stub shafts, is drilled a hole that is bushed and in which is placed a short shaft. On this short shaft is a fourth small pinion that is keyed securely. The upper end of the tube enclosing the steering column carries a brass case that is rigidly secured to it. The inner periphery of this case is cut to form spur teeth, making it an internal ring gear. This internal gear does not move, being held in one position constantly.

The hand wheel is secured to the short shaft

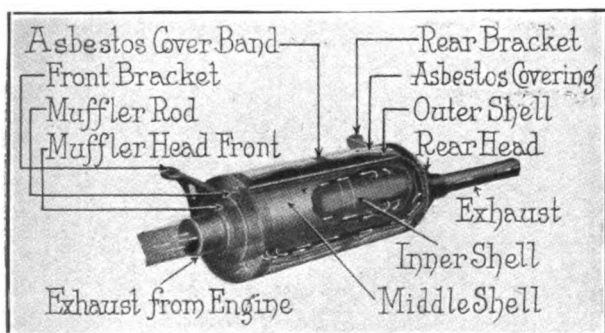


The Epicyclic Gearset by Which Reduction of the Movement of the Hand Wheel Is Obtained.

carrying the central small spur pinion, that is mounted in the bushing in the upper end of the steering rod, and it is retained by a nut. The shaft itself is retained in its position by the cover of the brass internal gear case, which is screwed on. The assembly is small and compact, and is sufficiently strong for any work that it may be required to do. The movement of the hand wheel will turn the central spur pinion on its shaft, and this will cause the three spur pinions to turn in the opposite direction against the fixed internal ring gear, so that there will be a reduction of the movement of the steering rod as compared with the movement of the wheel, and the three gears may be held securely against any pressure that may be caused by the drag link and the tie rod. The case containing the gears is packed with grease and no attention is required other than to renew the supply of lubricant at

infrequent intervals, despite its constant use.

Consider the movement of the steering column for a moment. If, for instance, the hand wheel is turned from left to right this will cause the three pinions mounted on the pivots on the plate or flange at the end of the steering rod to turn from right to left, rotating on their pivots against the fixed internal gear, turning the steering rod, and as the steering rod would be turned in the same direction as the three pinions are swung, the arm at the bottom of the column would be swung from right to left, drawing the connecting rod attached to the tie rod transversely from right to left, swinging the forward wheels so that they would move from left to right and to the degree that would correspond with the turning of the hand wheel. The reader will note that the design of the construction is such as to simplify the movements necessary for steering, that is, the machine is directed by turning the hand wheel from left to right, which would seem



The Ford Muffer, the Sectional View Showing the General Construction and Movement of Exhaust Gases.

to be the natural impulse of one who was without knowledge and wished to turn toward the right.

Housing Protects Control Rods.

The steering column tube also serves for a housing for the rods that vary the fuel supply and the ignition, these being straight metal members that are carried in mounts and are operated by hand levers that are swung on quadrants secured to the tub directly under the gear case. These rods are coupled by linkage to the carburetor and the timer, and the levers are retained by notches in the segments on which they are moved.

The steering column is a very substantial construction when installed in the chassis, it being secured to the dash and to the frame, and the tube surrounding the rod or post through which the steering is done effectually houses and protects this and the smaller rods controlling the carburetion and ignition.

The explosion of the fuel gas through ignition

in cylinder causes very rapid expansion, and the opening of the exhaust valve of a cylinder and the impact of the expanding gas will cause a considerable report even with so yielding a resistance as the atmosphere. This noise is objectionable and the report is reduced by conducting the gas into a pipe and into an expansion chamber that is known as a muffer or silencer.

The theory is that gradual reduction of the volume of gas exhausted will lessen the report or noise of the explosion in ratio to the period required for reducing the gas to approximately atmospheric pressure, and this is done by leading the gas into successively larger chambers until it may be carried into the air. The muffer of the Ford chassis consists of three sections of tube and two cast end plates, the assembly being retained by a steel rod and nuts. The forward end plate has a central opening that is the same diameter as the exhaust pipe. The rear end plate has an opening approximately the same diameter, but this is located near one edge, and the plate is fitted so that this opening is at the top or above the centre of the plate as the muffer is placed on the chassis.

Some Details of Construction.

On the inside of both plates are ridges or collars, those of the front end plate being about midway between the central opening and the edge, and at the edge, and those of the rear plate in the same relative locations. The smaller of the three tubular parts of the muffer is somewhat larger than the diameter of the exhaust pipe and the ends of this are carried in recesses in the centres of the plates. In this section, at the rear end, are a series of slots. The second section is carried by the inner collars or rings of the end plates, and in this at the forward end are a series of slots. The third section is mounted on the outer collars or rings of the end plates.

The gas from the exhaust is first carried into the inner chamber and through the slots at the rear end it passes to the middle chamber. It is then carried by pressure to the forward end of the middle chamber and thence through a second series of slots to the outer chamber and thence through the outlet and outlet pipe into the air. This affords a means of gradually reducing the pressure. The muffer is covered with sheet asbestos that is retained by three metal straps, which covering better silences the noise and prevents the heating of the muffer to a degree that might be dangerous. The muffer is secured to the chassis frame by two brackets and a series of four bolts.

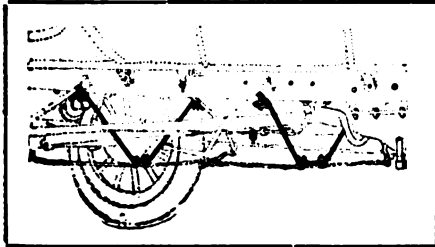
(To Be Continued.)

FORD CAR ACCESSORIES AND EQUIPMENT.

CLIP-ON TRUSS FOR FORDS.

A Practical Means for Eliminating the Usual Footboard and Fender Troubles.

Ford car owners who have been troubled with footboards that give under their weight when they step into their cars, and have been bothered by the rattle of fenders and other components of the machine, can now obtain a practical truss that will not only eliminate these troubles, but will add strength to the whole chassis. This device is manufactured by the E. F. von Wettberg Company, Bridgeport, Conn., and is designated as the Clip-On Truss. The name is appropriate, for the device simply clamps onto the running board brackets and consists of two iron braces, as can be seen in the accompanying sketch. There are no holes to be drilled for installation and no part of the car need be disturbed. The manufacturer states that the truss makes for a stronger and firmer chassis, and eliminates the possibility of broken, bent or shaky fenders, and also effects a large reduction in the cost of upkeep. The price per set is \$2.



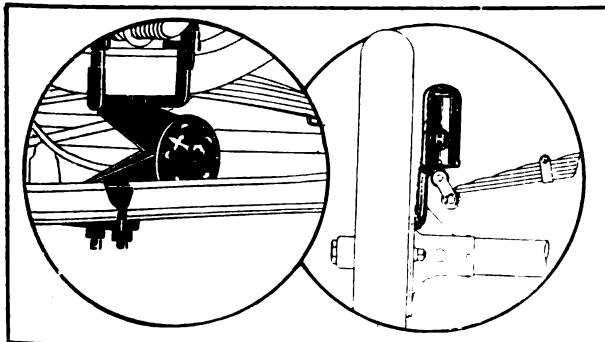
Clip-On Truss Installed on a Ford Chassis.

Company, Bridgeport, Conn., and is designated as the Clip-On Truss. The name is appropriate, for the device simply clamps onto the running board brackets and consists of two iron braces, as can be seen in the accompanying sketch. There are no holes to be drilled for installation and no part of the car need be disturbed. The manufacturer states that the truss makes for a stronger and firmer chassis, and eliminates the possibility of broken, bent or shaky fenders, and also effects a large reduction in the cost of upkeep. The price per set is \$2.

HARTFORD COMFORT COMBINATION.

Exceptional High Quality Shock Absorber Equipment Designed Especially for Ford Cars.

The Hartford Suspension Company, 143 Morgan street, Jersey City, N. J., has established a widely recognized reputation as a maker of quality automobile accessories that are remarkably low in price considering the service given. The company is now offering what it describes as the Hartford comfort combination for Ford cars, which consists of one Hartford shock absorber for the front and two Hartford cushion springs on the rear. This combination will, the company declares, afford perfect riding perfection and maximum comfort. Because



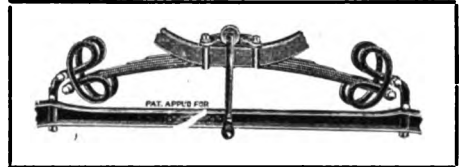
Hartford Comfort Combination for Ford Cars.

of the location of the Ford engine at the front, the weight there is greater than at the rear of the car, and consequently the spring action at that point is more pronounced. The Hartford shock absorber positively controls it. With less weight at the rear, greater spring resiliency is needed there, and the Hartford cushion springs supply it. The components of this combination have been designed especially for the Ford car. The price of the combination complete is \$12.

BRIDGES SHOCK ABSORBERS.

Shock Absorbers for Ford Cars Which Replace the Spring Shackle Bolts—Guaranteed to Be Unbreakable.

The C. E. Bridges Company, 4537 N. Whipple street, Chicago, Ill., is manufacturing the Bridges shock absorbers shown in the accompanying illustration. As can be seen, they are simple in construction, but are guaranteed to be unbreakable. They are made of high-grade spring steel and tested to withstand strains and stresses greater than it is possible to subject car to in ordinary road service. The absorbers replace spring shackles and thereby cradle the car against jolts, side sway or any inequality of the road surface. Installation is simple and can be accomplished by the car owner in about an hour. A complete set of four pairs of absorbers with necessary studs and oil cups retail at \$6.



Bridges Shock Absorbers in Position on a Ford Front Spring Assembly.

The automobile motor, like the human body, requires protection from the cold during winter weather, and as every owner knows, unless it is kept warm, it will be exceedingly difficult to start it. To overcome many of the so-called cold weather troubles, the Boice-Perrine Company, 64 Brookline avenue, Boston, Mass., is offering the widely known Thurmo covers for Ford hoods and radiators. These are exceptionally well made and are designed for long and hard service, as well as for appearance.

THURMO COLD WEATHER COVERS.

Exceptionally Well Made Protectors That Keep the Ford Motor Warm Long After Stopping.

The automobile motor, like the human body, requires protection from the cold during winter weather, and as every owner knows, unless it is kept warm, it will be exceedingly difficult to start it. To overcome many of the so-called cold weather troubles, the Boice-Perrine Company, 64 Brookline avenue, Boston, Mass., is offering the widely known Thurmo covers for Ford hoods and radiators. These are exceptionally well made and are designed for long and hard service, as well as for appearance.



Thurmo Hood and Radiator Cover for Ford Cars.

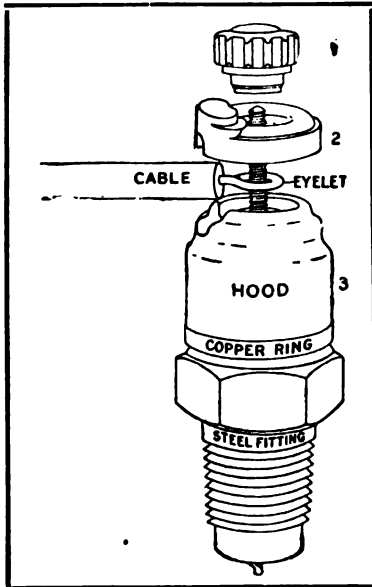
They are made of imitation leather, which will withstand all conditions of weather without its appearance being effected, and are lined with extra heavy wool waste, which insures warmth. They are equipped with adjustable flaps, to be lowered in front of radiator during cold snaps, and folded back out of the way when the temperature has moderated. The flap of grade A cover is fastened with Murphy curtain fasteners, which are guaranteed not to pull out from the material. The cover fastens to the hood fasteners of the Ford car by two snaps on each rear corner, which keep it always smooth. The color is black and the outer surface is smooth and unstitched, which prevents the accumulation of dust in seams and the leakage of rain or snow water.

The covers are made in two grades. Grade A differs from B in that it is heavier and is provided with the Murphy fasteners, while grade B has a different type of fastener. Grade A covers sell at \$3 each and B at \$2.25.

HERZ PRO-MO-TOR FOR FORDS.

Spark Plug Designed for the Ford Engine Affords Complete Protection Against Leakage, Moisture and Dirt.

The new type of Herz spark plug, illustrated herewith and manufactured by Herz & Co., 245 W. 55th street, New York City, is especially designed to meet the extraordinary requirements of a Ford engine. It is known as the Herz Pro-Mo-Tor for Ford cars. The insulation consists of two parts; a heavy stone insulator carefully encased in a steel fitting, and a mica tube of pure India mica inserted into the cavity of the stone. These two barriers effectively prevent any leakage of current. The manufacturer declares that even though the stone insulator should be broken, the mica tube would be amply sufficient to afford perfect insulation. This double protection is an outstanding feature of the plug.



Herz Pro-Mo-Tor for Ford Cars.

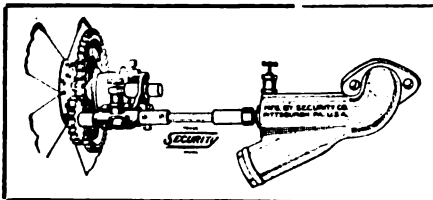
The upper end is formed to provide an entry for the cable. A peculiarly shaped rubber cap fits over the top of the hood and, with the insulated top nut, forms the cable connection.

Current enters the plug through a rod of unmeltable platinum alloy. The outside electrode is formed of a propeller shaped disk of the same material. The curvature of the disk impacts a whirling motion of the gases entering the plug chamber. This arrangement is designed to prevent carbon, oil or other matter from settling in the plug chamber. The manufacturer states that this new whirling disk electrode represents an important step forward in spark plug design. Some of the claims made for the Herz Pro-Mo-Tor are that it is absolutely self-cleaning, soot proof, water proof, dust proof and shock proof. The retail price is \$1 each.

IMPROVED WATER CIRCULATING PUMP.

Propeller Pump for Ford Cars Which Circulates About 15 Gallons of Water Per Minute.

An efficient cooling system will prevent overheating of the motor in hot weather, or while driving through mud, sand or at high speeds, it will reduce wear on the engine, save oil and fuel, reduce carbonization, eliminate the necessity of frequently refilling the radiator, and prevent or overcome a host of other motor troubles and bothers due to an inefficient



The Security Improved Water Circulating Pump.

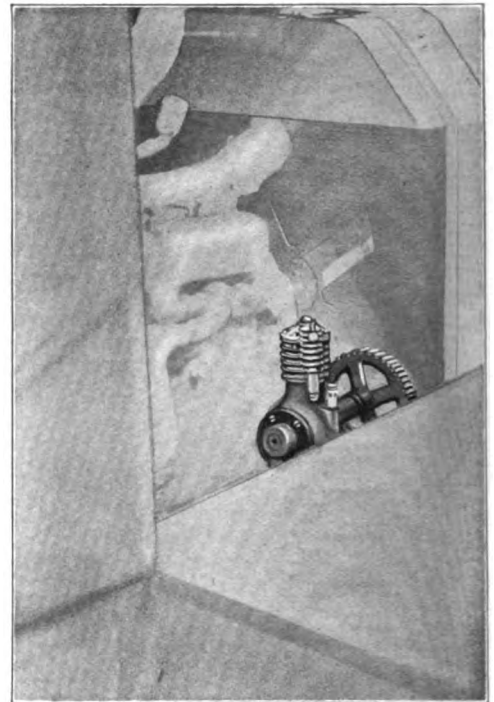
system. All these attributes are claimed for the improved water circulating pump now offered by the Se-

curity Company, 56 Terminal way, Pittsburg, Penn., which is shown in the accompanying drawing. This pump, which is an aluminum casting, incorporates the use of a propeller, which revolves inside the casting and affords a forced feed of water through the motor and radiator at a rate ranging from 10 to 15 gallons per minute. The manufacturer states that the propeller is positive in action and absolutely reliable. The pump can be easily and quickly installed and the only tools necessary for the work are a screw driver and a monkey wrench. An adjustable pinion bracket and a one-piece driving gear are included in the equipment, which sells complete at \$6. When writing to the Security company inquirers should mention this magazine, which will insure prompt attention.

"PURAIR" PUMP.

Pump for Inflating Tires Which Attaches Permanently to Ford Engines, Automatically Releases Air as Desired.

Ford owners can now enjoy the same convenience when inflating tires as is possible on the more expensive cars. The Hert Manufacturing Company, Indianapolis, Ind., is producing the Purair tire pump, illustrated herewith, which can be quickly attached to the car without machine work. The radiator does not have to be removed nor does the pump interfere with the installation of an electric starter. A new timer cover is supplied with the pump and a credit of 30 cents is allowed for the old cover. The new cover re-



"Purair" Tire Pump for Ford Cars.

places the old one and then the pump drive gear is screwed on to the end of the cam shaft. The pump attaches to the engine case by two screws and remains permanently in position. There are no packings, leather washers or rubber diaphragms in the pump to require frequent replacement. Three sets of metal rings are fitted to the pistons. The pistons and cylinders are made of the best gray iron, the bearings are of phosphor bronze and the crankshaft of steel. Twelve feet of rubber tubing is furnished with each pump sold. A feature of merit is that no pressure gauge is necessary with this equipment, the pump being fitted with an automatic relief valve, which can be set for the proper pressure, and will sound a warning when this point is reached. It is impossible to overinflate the tire, as the air is switched off when the tires are inflated to the desired pressure. The price of the pump complete is \$9. Inquiries should be addressed to the Hert company and should contain reference to this publication.

INDUSTRIAL HAPPENINGS AND COMMENT.

THE Studebaker Corporation's production of cars is likely to reach 100,000 instead of 60,000, as was first planned, according to an announcement made to a conference of Studebaker dealers at Toledo recently. Officials of the corporation also outlined a plan which is expected to make Studebaker the largest producer of commercial vehicles in the world.

The Imperial Wheel Works, Flint, Mich., is making plant extensions that will increase the capacity by 50 per cent. after the first of the coming year, according to General Manager Bonbright. The product is used chiefly in Buick, Dort, Chevrolet, Paterson and Monros plants. October production was the largest in the history of the company, and November bookings were even larger.

Henry Ford & Son is the name that has been decided upon for the company that is to manufacture the Ford tractor, and it is understood that Mr. Ford is prepared to invest approximately \$1,000,000 in the enterprise. There will be no outside stockholders and a large share of the profits will be divided between the workmen and the buyers of the machines. The old buildings on the site selected in Dearborn, just outside of Detroit, are to be torn down and a new four-story factory, 800 by 160 feet, is to be erected there. It will be the largest plant in the

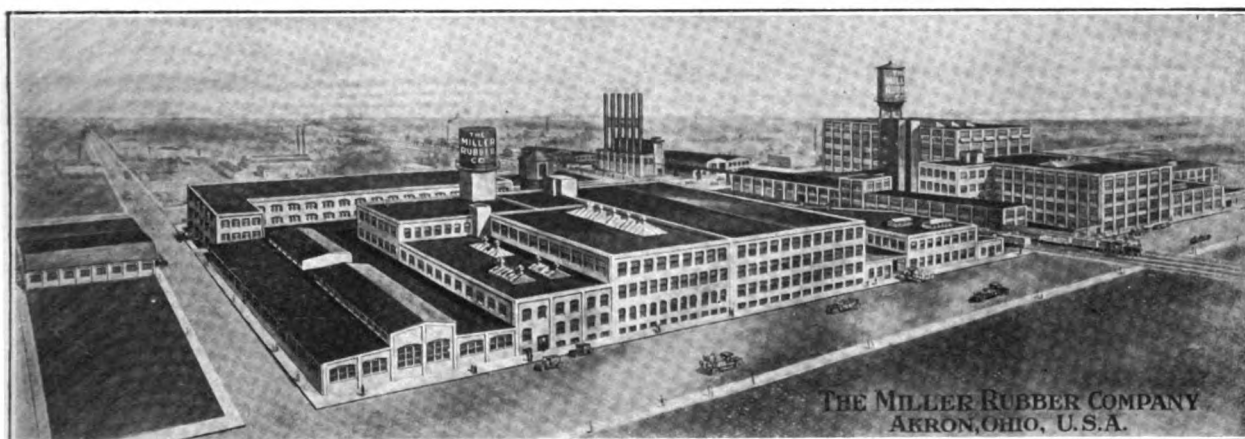
tional houses in Flint for the workmen and their families.

The Maxwell Motor Company has broken ground for one of the largest building operations undertaken for some time in Detroit motor car circles. The addition will cover about four acres of ground and will measure 860 by 130 feet, and in conformity with the style of the other buildings of the plant will be one-story high, with saw-tooth roof of glass and tile. The materials are to be brick and steel with cement floors. The schedule demands that the contractors turn over the completed building on Jan. 22 and then the company's facilities will have been increased from a capacity of 250 to 500 cars daily. The structure will be devoted exclusively to assembly purposes.

The Simplex Motor Car Company's plant, Brunswick, N. J., has been purchased by the Wright Aeroplane Company and its natural facilities for that kind of work will be further developed.

The Reading Standard Company, Inc., Reading, Penn., stockholders assembled at the company's office for the annual meeting Dec. 7 to select nine directors and to transact such other business as would lawfully come before the meeting.

The Universal Device Company, Three Rivers, Mich.,



The Modern Plant of the Miller Rubber Company, in Which Miller Tires and Rubber Goods Are Manufactured.

country devoted solely to the manufacture of agricultural tractors. Work on the buildings has been in progress for some time, and the power plant and the pattern shops are now ready for occupancy.

The Miller Rubber Company's plant at Akron, O., will have three acres of floor space added to its grounds when the new six-story building and the several one-story additions are finished. Before undertaking the manufacture of automobile tires, for which the Miller company now has a well earned reputation for quality, it made rubber articles. Today the product includes druggists' sundries, hospital and physicians' supplies, rubber toys and novelties. The growth of the company is due to the natural causes, said President Jacob Pfeiffer, chief among which is the public's appreciation of the exceptional standard of quality that enters into the construction of Miller goods, not the least of which are Miller tires.

The Buick Motor Company, Flint, Mich., is to double the capacity of its already immense plants during 1916, and expects to reach a production of 150,000 cars in 1917. A new motor castings foundry, 470 by 247 feet, is to be erected at once, while an addition to the drop forge plant, 40 by 200 feet, is already under way, and other structures will be put up. The additions will cost about \$500,000. The new castings plant will take the place of the Michigan Motor Castings plant, which will then be occupied by the Weston-Mott Axle Company, another General Motors subsidiary. The working force of the Buick company will be increased largely, but before that takes place it will be necessary to build several thousand addi-

was recently organized to manufacture and market the Universal sub-carburetor for all makes of cars, and the Universal foot control for Fords. The sub-carburetor has been improved to meet the demands of the present low proof gasoline and the officials expect to reach production of 25,000 in 1916. J. W. Fudge, secretary, general manager and organizer of the Go Motor Speeder Company of the same city, and also inventor of the speeder, made by that concern, has left that firm to join the Universal organization.

The Positive Supply Company and the Midland Supply Company, both of Davenport, Ia., have consolidated under the name of the latter company. The merger does not effect the sales force of the Positive company, it is announced. Maurice Hemsing will have charge of the automobile accessory department and W. G. Sandford will continue to do the road work.

H. M. Jewett, president of the Paige-Detroit Motor Car Company, has declared his belief that the increasing cost of materials, due to the demand occasioned by the European war and the high prices for labor, will make it impossible to further decrease prices of automobiles for some time to come. In fact, he expects that during 1917 prices will be increased considerably unless the situation changes for the better in the near future. Even where contracts for material have been secured it has been necessary in many cases to release parts and material concerns from their agreements and pay higher prices to keep them from going into bankruptcy.

PRACTICAL FACTS FOR NEW CAR OWNERS.

Elementary Instructions in the Economical Operation, Maintenance, Adjustment and Repair of the Carburetor of the New Car—Answers to Inquiries.

WHILE the principle of carburetion is comparatively simple, the construction of a successful carburetor is not the simple problem

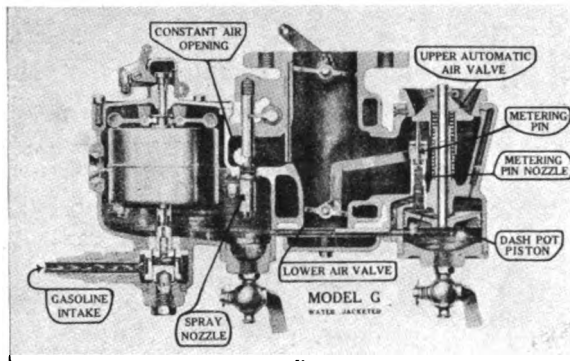


Fig. 1—Cutaway View, Showing Operating Components of the Rayfield Model G Carburetor.

that one is apt to imagine. If the motor ran at a predetermined speed at all times, the solution would be easy. However, the engine will at times turn at approximately 200 revolutions per minute, while at other times 2000 or more revolutions may be developed.

The amount of air drawn through the carburetor is wholly reliant upon the speed of the piston travel. Superficial consideration would lead to the belief that if more air was drawn through the carburetor, the amount of gasoline suctioned from the stand pipe would be proportionate, thus resulting in an ideal condition. This is not according to the law of liquid bodies, however. The flow of fuel from the jet increases under suction faster than the flow of air. If some provision were not made to compensate for this, a mixture too rich for proper motor operation would be produced. For this reason many manufacturers use the auxiliary air valve.

Details of Zenith Construction.

The Zenith Carburetor Company, Detroit, Mich., is the manufacturer of an instrument the construction details of which are somewhat of a departure from other makes in that it uses a compound nozzle and no auxiliary air valve. The compound nozzle really consists of two nozzles, one within the other. The gasoline for the inner or main nozzle is supplied directly from the float

chamber. The amount of fuel leaving this nozzle varies according to the engine speed, and, consequently, at high speeds the suction created would be great enough to produce a too rich mixture if not provided against. To defeat this action the compensating nozzle, which surrounds the main nozzle, delivers a steady rate of flow per unit of time. As the motor suction increases, a greater amount of air is taken in, but the amount of gasoline remains the same and the mixture grows poorer and poorer. In reality two types of carburetors are combined in one, a rich and poor mixture instrument, each counteracting the defects of the other. This design eliminates the necessity of using the auxiliary air valve at high speed.

The Zenith carburetor also incorporates a starting and idling well in its construction. When starting a cold motor an excess of gasoline is necessary to insure combustion, which is provided for by the well being graduated at its upper end into a small hole at the edge of the butterfly valve. When this valve is but slightly open there is a powerful suction at this point. The fuel is raised and mingles with the passing mixture. As the butterfly valve is opened wider, the speed of the engine increases, but the vacuum at the small hole decreases and the priming well ceases to operate. The compound nozzle draws the gasoline from the well and compensates for the speed change.

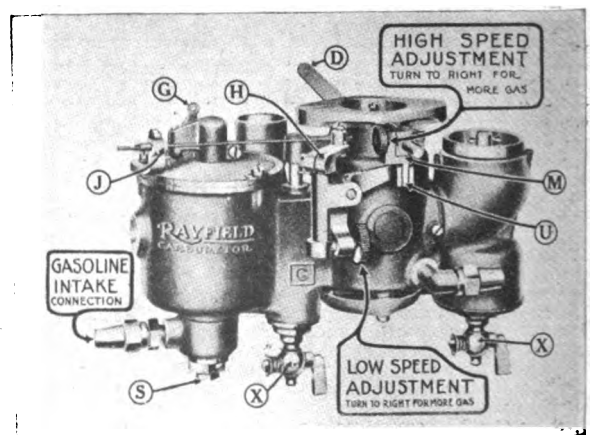


Fig. 2—View of Exterior of Rayfield Model G Carburetor, Showing Adjustment Components.

Consistency

Consistency is consecutive good taste; good judgment shown in a series of decisions

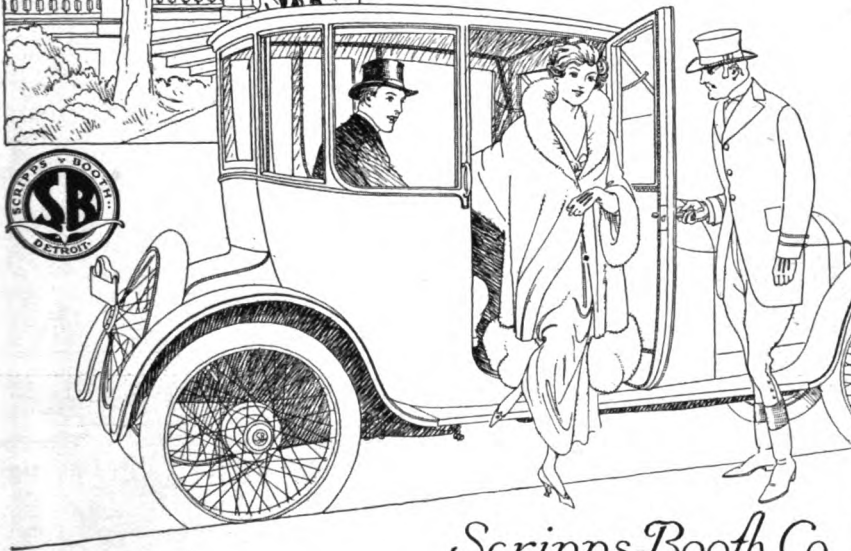
Good taste in the choice of a home, and good judgment in the selection of opera or theater, demand consistency in the choice of a vehicle to connect home and pleasure—the car measuring up to consistent standards.

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Scripps-Booth luxurious light cars are in use between the most exclusive homes of the better communities and those amusement and shopping centers where taste dictates, the consistency of taste of this class of user indicating the real quality of Scripps-Booth.

Roadster \$775 — Coupe \$1450

*Scripps-Booth Co.
Detroit, Mich.*



The carburetor is properly set at the factory for the type of machine on which it is to be used. The slow speed mixture can be adjusted by the regulating screw, which controls the air supply to the priming well.

Rayfield Model G.

The Rayfield model "G" carburetor has been in use for about two years and is widely recognized as an instrument possessing all-around efficiency. Its conspicuous features are that it has no air valve adjustment and has gasoline adjustments, for low and high speeds. Two jets are used in the instrument. The quantity of gasoline drawn through these is controlled by outside adjustments, and the air is supplied through three openings. The operation is simple. The air is drawn through the instrument by the suction created by the pistons. It rushes around the main nozzle and metering pin nozzle and picks up the gasoline in the form of spray. At low speeds the air is drawn through the carburetor only through a small fixed opening, the other two air openings remaining closed. This arrangement produces a strong suction on the main nozzle and consequently obtains perfect idling.

At high speeds the air is drawn through the

three openings, thus supplying a large volume of air. The automatic air valve, which controls both of the auxiliary air openings, is directly connected to a dash pot piston. This piston operates in a gasoline dashpot, which is always supplied with fresh gasoline, and from which fuel is drawn to supply the metering pin jet.

This piston serves three purposes. Its first function is to prevent the air valve from fluttering at any speed or any condition of operation. Its second purpose is to retard the opening of the air valves for a few seconds when the throttle is thrown open. This produces a strong suction on both jets and supplies additional gas for acceleration. Its third purpose is that when the air valve starts to open, it pushes down the dash pot piston, forcing the gasoline from the lower part of the dash pot chamber up through the metering pin jet, from where it is sprayed into the mixing chamber. However, this action only takes place when the motor is accelerating and when the additional gas is needed.

Fig. 2 shows an external view of the Rayfield model G, while Fig. 1 illustrates the working principle. The letters in the illustration have reference to the following:

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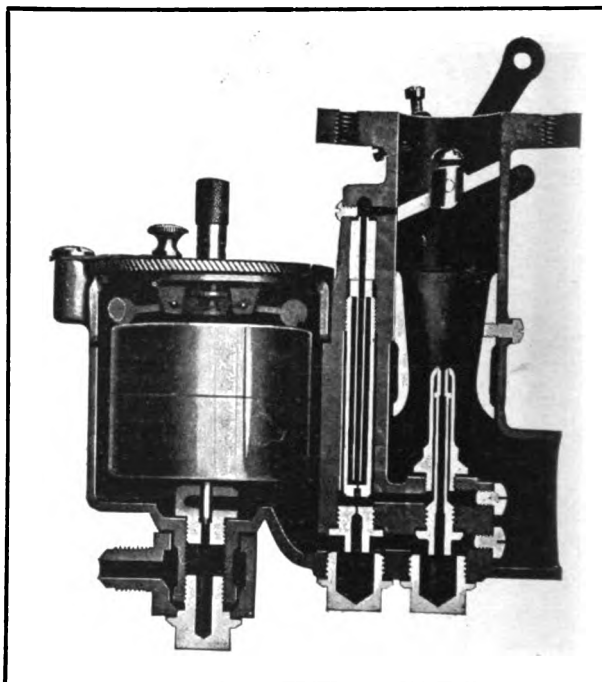
(When Writing to Advertisers, Please Mention The Automobile Journal.)

D—Throttle arm
G—Priming Lever
H—Gas arm
M—Regulating cam

S—Drain nut
U—Block controlling needle valve
X—Drain cocks

Adjusting the Rayfield Carburetor.

The following is the advised procedure for adjusting this instrument. With the throttle closed and the dash control down, close the nozzle needle by turning the low speed adjustment to the left until the block U slightly leaves contact with the cam M. Then turn to the right about three complete turns. Open the throttle about one-quarter way and prime the carburetor by pulling steadily for a few seconds on the priming lever G. Start the motor and allow it to run until warm and then retard both the spark and throttle levers. With the motor thoroughly



The Zenith Carburetor, Showing Constructional Details.

warm the final low speed adjustment can be made by turning the low speed screw to the left until the motor slows down and then turn to the right a notch at a time until the engine idles smoothly. This is the low speed adjustment.

The high speed adjustment is made with the spark lever advanced about one-quarter. Open the throttle rather quickly. Should the motor back fire there is a lean mixture. Correct this by turning the high speed adjusting screw to the right about one notch at a time, until the throttle can be opened quickly without causing back firing. If loading (choking) is experienced when running under heavy load with throttle wide open, it is an indication that the mixture is too

rich. Rectify this by turning the high speed adjusting screw to the left.

It will be well to keep in mind that adjustments made for high speed will in no manner effect low speed and that the low speed adjustment must not be used to correct a faulty mixture at high speeds.

Stromberg Type B.

The Stromberg type B carburetor is used very successfully on Autocar trucks, as well as other motor vehicles. A sectional view of this instrument is shown in Fig. 3. The spray nozzle, PN, is mounted in the centre of the carburetor, in the centre of the float chamber. The point of the nozzle is $\frac{3}{16}$ -inch above the normal gasoline level and is surrounded by a modified venturi tube. When the correct gasoline level is reached the fluid should be about one inch from

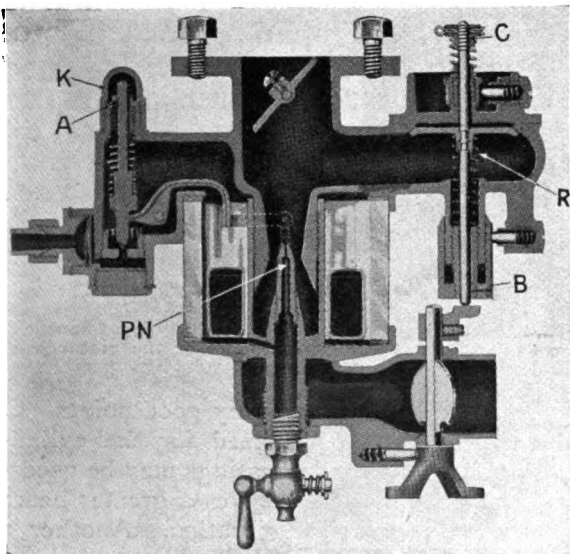


Fig. 3—The Stromberg Type B Carburetor.

the lower edge of the glass. This level is correctly set at the factory and should require no attention, but should it for any reason require attention, remove the dust cap K and turn the adjusting screw A until the proper level is reached. If the level is too high the nut should be turned to the right, and if too low, turn to the left, or up. It should be borne in mind, however, that this level should not be changed unless absolutely necessary.

The low speed adjustment is made by turning up the adjusting nut B until the spring R, which is the low speed spring, causes the auxiliary air valve to seat lightly. Ascertain that the high speed or top spring is free and does not contact with the nut on top of the auxiliary air valve

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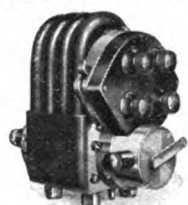
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stem. Start the motor and with the throttle closed, turn the nut B in either direction until the motor idles properly. This is the low speed adjustment.

Now open the throttle wide and if the motor back fires through the carburetor, the mixture is too lean and should be remedied by turning up the high speed adjusting nut C until the back firing ceases. If after making this adjustment the motor loads, the mixture is too rich and the nut C should be turned down until proper operation is obtained. This is the high speed adjustment. The spring controlled by the nut C should always have at least 1/32-inch clearance between it and the nut on top of the auxiliary air valve stem when the motor is at rest.

READERS' QUERIES.

Values of Single and Block Motors, Timing the Reo Motor, Detachable and Demountable Rims, Permanent and Electro Magnets, Influence of Color of Tire's Mileage, Current Consumption by Dim and Glaring Lights.

Single-Cylinder Vs. Block Motor—B. F. H., Brownsville, Me.

Which do you consider the better type of motor, the one using separately cast cylinders or the motor having the double or single block?

Both types have their very good points. One advantage generally claimed for the cylinders cast singly is that more bearings may be used between the cranks, which gives a greater bearing surface and minimizes vibration. Another advantage usually referred to is that should one cylinder become ruined beyond repair, as in the instance of imperfect piston assembly, it is more economical to replace one cylinder than to replace a block.

Among the attributes claimed for the block construction are the qualities of greater rigidity of construction, saving in weight, a smaller number of connections, and a more compact motor, which allows a shorter hood to be used. At present the majority of motors are constructed in block design.

Timing the Motor—H. H. M., Westport, Conn.

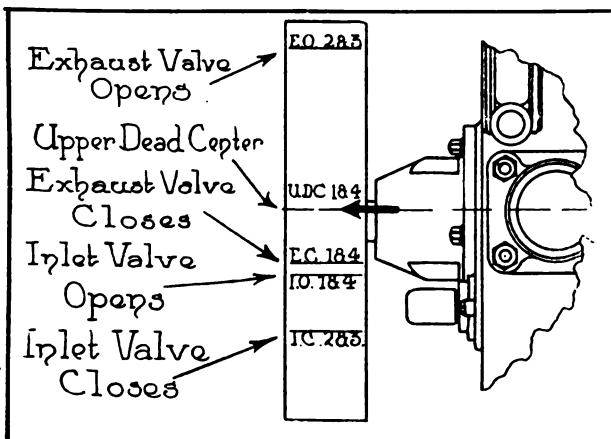
Will you please state the correct timing for the 1912 Reo touring car? How can I check up this? I recently had my car overhauled by a local mechanic and there are certain conditions which lead me to believe that the timing is wrong.

The timing for the car is plainly stamped on

(When Writing to Advertisers, Please Mention The Automobile Journal.)

the face of the flywheel, as shown in the accompanying illustration. The mark I. O., means that the inlet valve opens; I. C., that the inlet valve closes; E. O., that the exhaust valve opens; E. C., exhaust valve closes; U. D. C., 1 and 4, indicates the upper dead centre of cylinders 1 and 4, and the mark U. D. C., 2 and 3, means the upper dead centre cylinder 2 and 3. These marks indicate what the position of the flywheel should be when the valves open and close. The cylinders in the motor are referred to, beginning at the one nearest the radiator, by the numbers, 1, 2, 3, 4.

The first operation in timing is to open the pet cocks over the exhaust valves so that the motor can be easily turned over by hand. The first valve to be checked up is the inlet in the No. 1 cylinder. Turn the flywheel until the mark U. D. C., 1 and 4, is nearly in line with the reference point on the cylinder, and then turn it over a little more until the mark I. O., 1 and 4, registers



The Timing Schedule of the Reo 1912 Model Touring Car.

with the reference point. At this point the inlet valve of the No. 1 cylinder should just be commencing to open. By this is not meant that the valve should be partly opened, but just beginning. Having determined that the opening is correct, proceed to check its closing point. Turn the flywheel over until the mark I. C., 1 and 4, is close to the reference point. The inlet valve in the No. 1 cylinder should now be closed.

The exhaust valve in this cylinder should be checked in a similar manner, according to the marks given. Having ascertained that the valve timing for this cylinder is correct, follow the same procedure with the remaining cylinders. A variation of not more than $\frac{1}{4}$ -inch either way from the reference point is allowable.

If after having determined that the plungers are operated by the cams at the proper time that still the valves open because of the space between



1916 Model
Metz "25" Roadster

METZ

"25" Roadster, 1916 model. Price \$600, completely equipped. Built on same chassis as Touring Car, with 108-inch wheel base and carries identical equipment, including electric starter and electric lights, 25-horse power water-cooled motor, large wheels and tires, rain vision wind shield, instant one-man top, speedometer, built-in gasoline gauge, signal horn, etc. A wonderful hill climber, and for reliability in road performance is absolutely unsurpassed. Write for DEALER particulars and new illustrated catalog "Q."

NOTE—The Metz "25" Touring Car, 1916 model, completely equipped as above described, is also listed at \$600.

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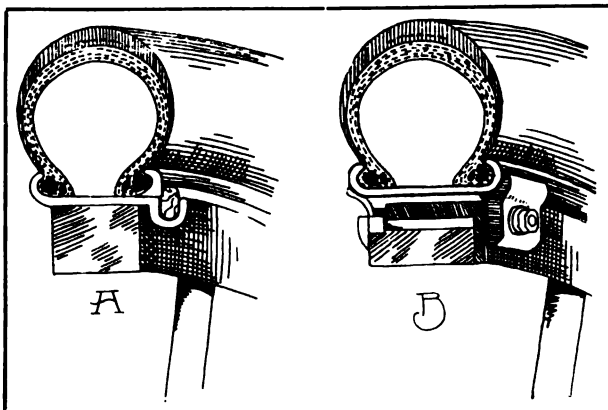
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the plunger and the valve stem, this back lash can be taken up by the adjusting screw at the top of the plunger. However, it is essential that there be a space of about the thickness of the ordinary name card between the push rod and the valve



Sketch Showing Distinguishing Constructional Details of the Detachable and Demountable Rims.

stem when the valve is fully closed.

Detachable and Demountable Rims—R. S. D., Norwalk, Conn.

What is the main difference between detachable and demountable rims? Which type is used with the Autocar 3000-pound truck?

(When Writing to Advertisers, Please Mention The Automobile Journal.)

When the Autocar is equipped with pneumatic tires the detachable type of rim is generally used. This type is, as its name suggests, designed so that it is possible to remove a tire very quickly. Its construction includes the use of two rings, one of which is split. The perfect ring fits over the rim of the wheel, while the split ring is placed behind it and fits into a channel on the rim provided for its reception. At the ends of the ring are two lugs that fit into corresponding holes drilled in the rim and lock the tire onto the wheel.

The demountable rim is designed so that the tire and the rim may be removed from the felloe of the wheel as a unit. The general practise is to carry an extra rim on which is a tire already inflated and ready to be slipped on in place of a tire that becomes unserviceable. The change is made quickly and with a minimum of trouble. Both types are shown in the accompanying sketch.

Aluminum Vs. Steel Running Boards—R. L. H., Chicago, Ill.

I am considering the advisability of replacing the wooden running boards of my car with a set constructed of metal. Would you advise the use of steel boards or those made of aluminum?

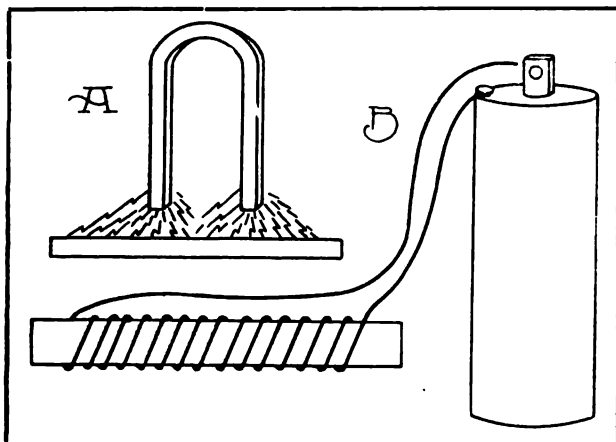
Aluminum running boards are used exten-

sively. They are generally cast with corrugations, which afford an excellent foot purchase. However, aluminum being a comparatively soft metal, the surface will wear smooth in time and become slippery. To the contrary, aluminum boards do not require painting as do steel. A common complaint offered by motorists using aluminum boards near the seashore is that they become oxidized and give off a white powder. In that case the wear is very rapid.

Steel running boards are made of a tougher material than the aluminum type, and consequently wear longer. They too have corrugations and they do not easily wear down to a slippery surface. This type of board requires painting, but not very often, because the corrugations take the largest part of the wear. The paint offsets the possibility of rust.

Magnets—H. M. P., Worcester, Mass.

Will you explain through your readers' column the



Sketch illustrating the Differences of Principle in Permanent and Electro Magnets.

difference between a permanent and electro magnet? What is meant by a compound magnet?

The permanent magnet is a piece of steel which has been magnetized and will generally retain its strength for a long period. Because of its ability to retain the magnetism it is termed a permanent magnet. This type is possessed of permanent attractive qualities, because once it has drawn a piece of iron or steel to it, the piece cannot be released except by force. The electro magnet, also termed the solenoid, utilizes electric current each time magnetism is produced. The apparatus usually consists of a coil of soft wire wound round a soft iron core. When the current is switched on the field induces a much greater flux in the core than it would induce in the air. When the current is switched off the most of the magnetism in the core vanishes and the object is

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instantly released. The two types of magnets are shown in the accompanying illustration.

A horse shoe magnet, such as is commonly used in the magneto, is often referred to as a simple magnet. By placing two or more of these simple magnets on top of each other, it is found that the magnetism is much stronger. When two or more simple magnets are built on each other in this manner they constitute what is known as a compound magnet.

Leaky Carburetor—W. H. M., Mt. Healthy, O.

I have a Grant six, 1915 model, equipped with a Ray-field carburetor, and have been troubled with the carburetor leaking when cold. The gasoline pours out in a stream until the machine has run for about three miles. I have lowered the float as low as possible.

The following suggestions may result in remedying your trouble: If the float is not too high, it would appear that the needle valve does not fully seat. It may be that the float leaks and causes the valve to remain unseated, or there may be foreign substance on the valve seat. If you have not already done so, disassemble the instrument and give it a thorough cleaning and examination. Ascertain that the needle valve is smooth and perfectly true. Determine that the arm contacting with the bottom of the float and the needle valve is not bent.

Electric Lighting—G. W., Cohasset, Mass.

Which consumes the most electricity, a full headlight or dimmed?

What are the advantages or disadvantages over the other of the three types of live axles?

Would you consider the differential of a 1915 car properly assembled and in correct working order, if upon jacking the car and turning one rear wheel, the other rear wheel did not move?

There is no difference in the consumption of current whether the headlight be dimmed or turned on full. The common method of dimming the headlight is by placing a resistance in the circuit. The current is absorbed by this obstacle and is dissipated in the form of heat instead of light.

The three types of live axles are termed full floating, three-quarter floating and semi-floating. The first mentioned is, as name would indicate, a full floating part and carries no weight. The rear wheels rest on bearings which are fitted to the outside of the housing, the axle shafts being used merely to supply the motive power. It is possible to remove this axle shaft without disassembling the rear end, and the car would coast down a grade or it could be towed. The majority of modern cars are using this type of axle.

The three-quarter floating type is permanently attached to the wheel usually by bolts. The

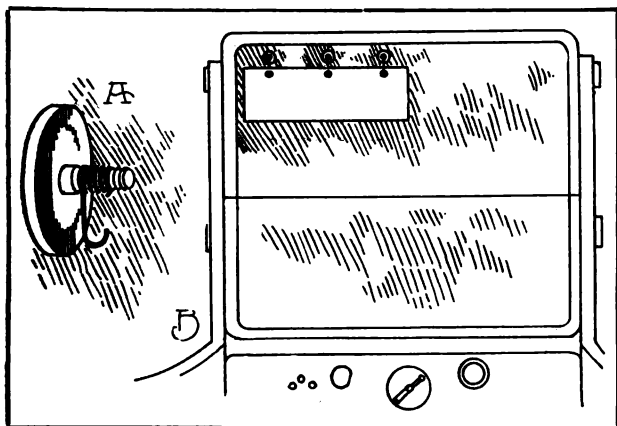
weight of the load is carried by the housing.

The semi-floating type is a complete departure from the other types. The shaft rests on bearings inside the housing and the entire weight of the load is supported by the axle driving shafts. The ends of the shafts are keyed to the hubs of the wheels and usually locked there by nuts and cotter pins. With this type of axle the shaft cannot be removed from the car without removing and disassembling the entire rear end.

When the rear of a car is jacked and both rear wheels are free, the turning of one rear wheel should cause the other wheel to revolve in the opposite direction. If the differential has been assembled recently, it may be that the bearings are rather tight and will gradually wear in.

FASTENING SIGNS TO WINDSHIELDS.

There are sundry ways by which to secure a sign, such as jitney drivers use, to a windshield,



A Simple Device for Attaching a Sign to the Windshield.

but not all of them make for neatness. Fig. A illustrates a simple method which has no objectionable features. It is based upon the same principle adapted to holding shaving mirrors on window panes. Place short screws in the holes in three such rubbers as are to be found upon the porcelain stoppers of certain kinds of bottles. The screws should fit snugly, wire should be wound around the threads that project and the ends of the wire should be formed into hooks, as at A. Coat the rubbers lightly with glycerine and then stick them onto the windshield, as at B. The vacuum created will sustain quite a heavy weight.

STORING THE CAR FOR THE WINTER.

There are many motorists who prefer to store the car, if not of the enclosed type, rather than operate it during the winter. Some imagine that

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For FORD TOURING CAR

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to run your Ford this winter without a limousine top like this? The price is only \$60-Complete.

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The S-M-C Improved Brake Lining is made to but one standard and one quality—the best. It is made in all widths and thicknesses. It is heat resisting, as well as water, oil and dust proof. It will grip and hold until completely worn through. It protects both life and property all the time.

Our trade mark is the owner's guarantee of protection, quality and service.

There is a special set of linings for Ford cars, three pieces, cut to length and supplied with all necessary rivets.

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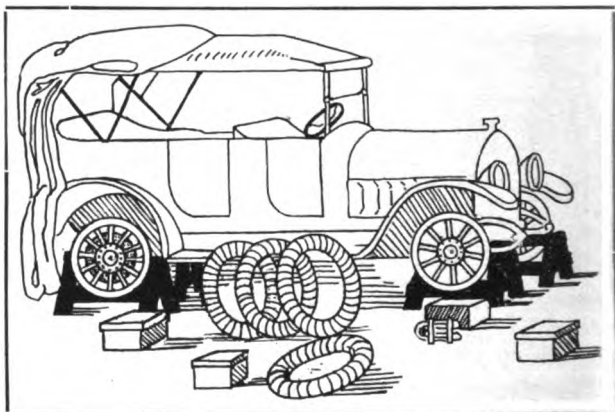
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winter storage requires nothing more than running the car in the garage and leaving it there until it is again time to use it. Such is not the case, as a car thus left would greatly deteriorate in value. Of course if the car is to be kept in a well heated place it would only require that each wheel be jacked and the tires relieved of pressure.

In most instances, however, the car is stored in an unheated shed or building. Under these conditions the following precautions will amply repay the owner for the time spent in carrying them out.

First jack all four wheels and place wooden horses under the axles, as shown in the accompanying illustration. If metal jacks are used to permanently elevate the car, strips of leather should be placed between the lifting head of the jack and the axle. This is a precaution against rust, which is sure to result when contacting metal surfaces are subjected to dampness.

Remove the tires from the wheels and also re-



How the Car Should Be Prepared for Winter Storage.

move the inner tubes. The shoes should be thoroughly cleaned, and when dry, sprinkled well with French talc or soapstone. They should then be wrapped in paper in the same manner as received from the dealer. Release all the air from the tubes and sprinkle them with talc. They should then be neatly folded and stored in boxes.

Scrape the rim of the wheels and apply a coat of graphite. All mud and grease should also be removed from the body and then a coat of polish applied. Should there be any bright metal surfaces on the car, such as headlights, radiators, etc., these should be cleaned and coated with vaseline. Do not lower the car's top. The better policy is to keep it open, which has a tendency to keep it well stretched and smooth. It should be thoroughly brushed and then coated with a good preservative.

Of course all water should be drained from the cooling system. This applies even to a car stored in a heated garage, because water will rust the metal when allowed to stand. The best way to drain the water is to open all petcocks. When the water has stopped running, start the motor and rock the car for about a minute. This short period of operation without water will not hurt the motor. If the car is to be stored where there are to be very low temperatures, it is a good plan to close all the petcocks and place a little denatured alcohol in the system. This will safeguard against all freezing.

As a preventative against fire, drain the gasoline from the tank, feed line and carburetor. This will also tend to force out any sediment that may have lodged in the system.

Next drain all oil from the crank case and flush the part with kerosene. A little kerosene should also be placed in each cylinder. This will prevent the oil from gumming on the cylinder walls and the piston rings from sticking. It will also tend to loosen carbon.

As a last precaution, a cover should be placed over the entire car to protect its finish.

COLORING BRASS BLACK.

A well known chemist submits the following as an easy yet effective method of coloring brass articles black. Dissolve blue vitriol in water and then add a quantity of washing soda until a precipitate is formed. The liquid should then be poured off. The precipitate is carbonate of copper. When this substance is mixed with strong ammonia and heated to 150 degrees Fahrenheit, the solution will stain any brass article black. Before emerging in the solution, however, the piece should be thoroughly cleaned, using a potash solution.

A lean mixture will often cause "popping back" through the carburetor. This is the result of the very lean mixture burning slowly, so that a naked flame is present in the cylinder when the intake valve opens. The incoming gas will be ignited in the manifold before it can reach the combustion chamber.

When wires leading from the storage battery contact with metal parts they should be heavily insulated, and held stationary. The insulation on wires often becomes chafed, which results in short circuiting. Stray sparks, due to poor insulation, have frequently caused fires by igniting loose grease and gasoline.

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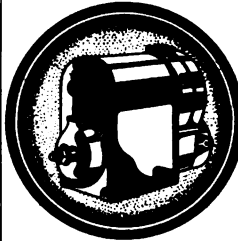
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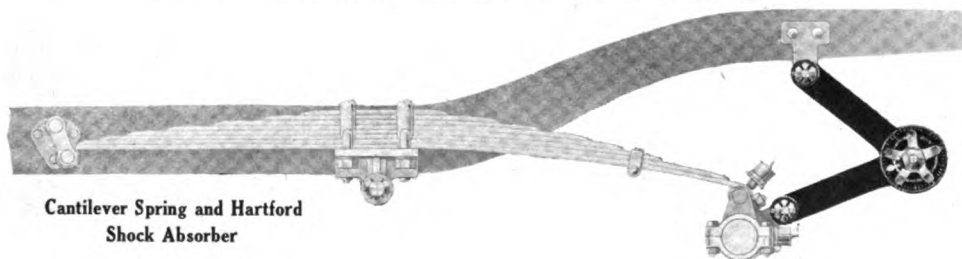
RIDING COMFORT WITH CANTILEVER SPRINGS

When roads grow rough, the activity of the cantilever type of spring requires the effective control
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AT THE
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Hartford
SHOCK ABSORBER

SEE IT
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Cantilever Spring and Hartford
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to insure riding comfort. Dissipation of the surplus energy, by frictional absorption, perfects the function of this type of spring in particular, noticeably improving the traction of the car, absorbing all the small but disagreeable vibrations, and promoting practically perfect results in the riding qualities of the car.

Attachment is simple. The above illustration shows the relative positions of the spring and shock absorber and suggests the harmonious operation of both.

If your car has cantilever springs or other active springs, it needs the Hartford Shock Absorber in order to carry its load with comfort over every road.

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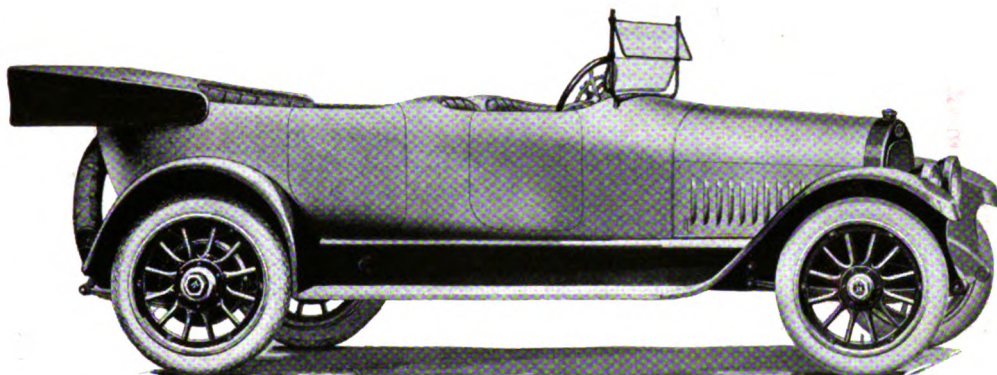
Remember, every red-blooded American really wants to drive a better car than he began with.

When you show him the Cole 8 at \$1595 you are talking to a man whom we have already half-sold.

Write for our 1916 Dealer Proposition. It's new, attractive and may be just what you need to double your present profits.

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NOW \$1595



Model 860—Standard Touring Car

NOTE the strikingly-beautiful body, with its full-flowing lines and center wave effect. The disappearing auxiliary seats are concealed back of the individual front seats. The car has a wheel-base of 127 inches, affording three inches additional room, lengthwise, in the tonneau. Other features of special importance are:

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The long, semi-elliptic springs—rear 57 inches, front 39 inches—and the direct spring drive, with the rear springs swung under the axle, bringing the car close to the ground without interfering with the road clearance.

The big, full-floating rear axle with silent, helical gears; oversize roller bearings; heat-treated front axle with ball bearings in the steering knuckles to insure easy steering.

The improved motor, with counter-balanced crank shaft and aluminum pistons.

The latest improved Delco separate motor, generator and timing equipment.

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Automobile manufacturers with names known as household words throughout the world are equipping their cars with the

DIXIE Magneto **20th Century Ignition**

They could have adopted cheaper ignition systems but they have refused to profit at the expense of their reputations.

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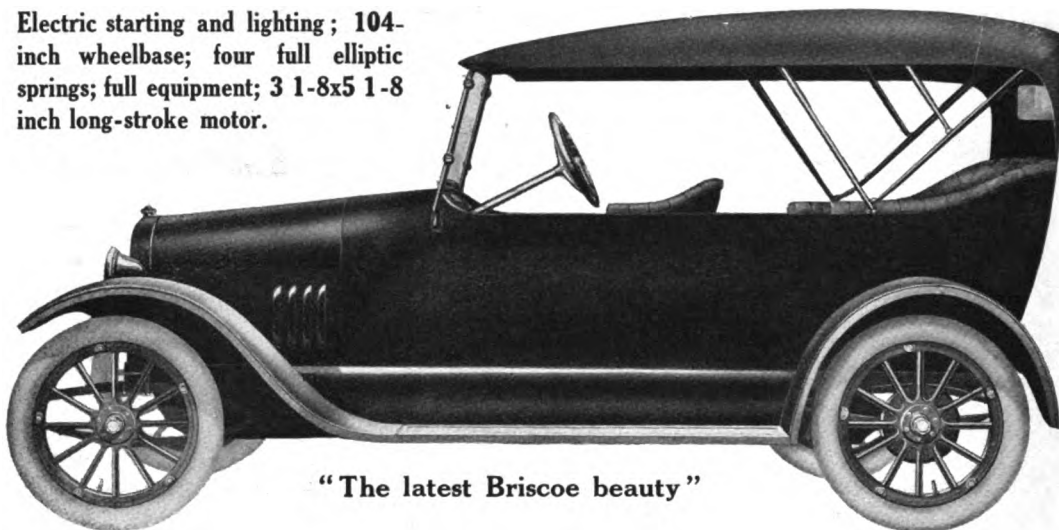
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Electric starting and lighting; 104-inch wheelbase; four full elliptic springs; full equipment; 3 1-8x5 1-8 inch long-stroke motor.



"The latest Briscoe beauty"

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THE Briscoe Motor Company is now a \$6,000,000 organization, manufacturing every part of its cars under its own supervision. For some time past plans have been under way whereby the company would be enabled to take care of the great and increasing public demand for its product, independent of outside sources of supply for anything but raw material.

These plans have now culminated in the enlargement of the company and the acquirement of a number of parts and accessory plants. The plant of the Mason Motor Car Company of Waterloo, Iowa, was purchased and the machinery moved to Jackson; the plants of the Jackson Motor Parts Company and the Jackson Metal Products Company were also secured. And as a final step in assuring adequate parts supplies, the \$1,000,000 Jackson plants of the Lewis Spring and Axle Company were added to the company's holdings.

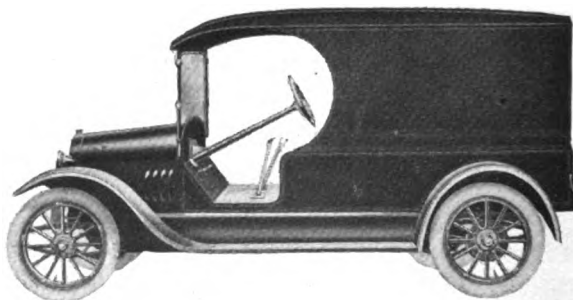
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THE Briscoe line offers you the opportunity to sell the maximum number of the automobile buyers in your territory, and to give to each one exactly the car he wants.

The Briscoe DeLuxe Models---the Eight 38 at \$950, and the Four 38 at \$750---have already established themselves in a country-wide popular favor that increases as each month rolls around.

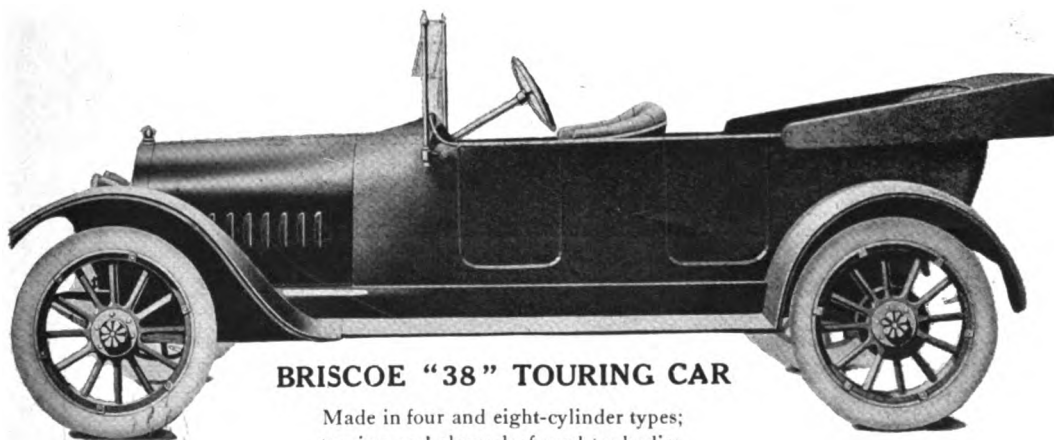
The new Briscoe Twenty-Four will meet with the instantaneous approval of the great mass of the buying public interested in a popular-priced car, for it is literally "the car the public built". It is a car without excuses, omissions or apologies---It embodies everything that the average man wants in his motor-car, including a number of things he doesn't expect to get at the price. And it's a beauty that will stand comparison with any car at any price.

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Again we urge upon you---WRITE OR WIRE TODAY REGARDING YOUR TERRITORY. We shall sign up no more dealers than we feel sure we can adequately care for.

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Made in four and eight-cylinder types;
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And—he has back of him always the comforting assurance that he does not have to waste energy selling Delco Equipment—but that on the contrary Delco Equipment is a very tangible help to him in the selling of the car.

It is a good thing to be the dealer representative of a Delco Equipped Car.

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**OTHER POLISHES CLEAN—BUT—VICTROLENE
INSTANTLY REMOVES TAR, TARVIA, AND
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*Keeps the
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Victrolene cleans and polishes at the same time. Instantly removes road oil, tar or Tarvia. It protects and preserves the car finish.

Any one can keep his car looking fresh and new with Victrolene—simply moisten a soft cloth and wipe over the surface and then rub with a dry cloth. That is all—and it can be done in one fourth time it takes to wash with soap and water.



*No Other Polish
Is Like
Victrolene*

It is the only preparation that cleans and polishes at the same time. It is non-inflammable, non-combustible and non-poisonous. It is so scientifically compounded that it needs no shaking.

Your dealer will tell you of Victrolene quality and of its wonderful efficiency. Garage-men use it and find it invaluable.



*How the
Owner Saves*

Any member of the family can keep a car looking wonderfully attractive. The cost of washing and polishing is saved and this will buy enough Victrolene to polish the car

hundreds of times. There is great satisfaction in having a fine appearing car for the owner and those who ride with him.



*A sample large enough
to cleanse and polish an entire
car will be sent for 10 cents which covers the cost of mailing. For furniture it is supreme.*



Dorsey Mfg. Co.

80 Broad Street

BOSTON,

MASS.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

National Automobile Trade Paper Circulation

DOES IT FIT YOUR BUSINESS?

There are very few producers in the automobile industry who enjoy a nation wide market.

Such concerns have millions of dollars invested in their enterprises. Their large resources have enabled them to build up selling organizations that represent the highest development in business building.

The idea of spending a hundred thousand or a million dollars on an advertising plan or other promotion work need not frighten them. They can make costly investments. They can stand costly mistakes. For the great earning power of their companies and their great resources can offset a loss that would wipe out, or at least shake the business standing of any ordinary concern.

Ninety-nine out of every 100 companies in the automobile business are ordinary concerns. They have need to exercise the greatest care in the development of their business. They can't afford to take big chances. They must adjust their selling and other plans to their resources.

Many of them find—as other business men have in other businesses—that it is the best plan to concentrate in a given territory and devote all their energy to it until their business has been fully developed there, and then expand their operations. A strong effort in a section of the market may become mighty weak and ineffective if it is spread over the whole United States.

Even the largest businesses know the benefits of this concentration. The great sales organizations divide the country into districts, turn each district over to a sales manager, and leave it to him to cultivate the market intensively. Some businesses, like the great oil operators, divide their whole organization up on sectional lines.

If the difficulties in some field are unusual, or the opportunities exceptional, these companies also concentrate their publicity and advertising support where it will do the most good. They make a special effort in the chosen section, while they continue their national campaigns as before for the benefit of their whole organization.

These great national advertisers use The Automobile Journal because they know it is the most effective of all trade papers in the eastern field. Its use is a part of their policy of concentration, for it directly benefits their sales organizations in the following states:

Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, District of Columbia and Ohio.

Do your trade papers just fit the field in which your representatives are located and which you desire to develop?

In its field The Automobile Journal has a concentrated circulation of 20,237. In the states mentioned it reaches one in every 36 car owners. It reaches also one in every six trade interests.

Those trade papers which have a national distribution have an average circulation, according to their own claims of from 10,000 to 20,000 copies.

There are 2,500,000 car owners in the United States.

There are 40,000 trade interests in the United States.

How many readers among these car owners and trade interests can be reached with a national circulation of from 10,000 to 20,000? How much can that circulation benefit you and your selling representatives?

The field covered by The Automobile Journal is the greatest motor vehicle and accessory market in the world. More than one-third of the business done by automobile and industrial interests in the United States is transacted in those states.

Automobile Journal Publishing Company

TIMES BUILDING,

PAWTUCKET, R. I.

COE'S WRENCHES



UNEQUALLED FOR QUALITY THE WORLD OVER

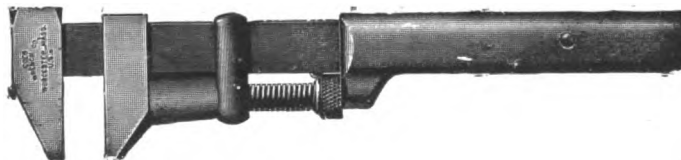
The wrench is the most used and the most useful tool in a motorist's kit.

COE'S Special Automobile Model is a perfect tool. The jaws are hardened special quality tool steel to withstand hard usage, and the handle is long to afford great leverage. The wrench is thin to work in space inaccessible for ordinary wrenches.

Coe's Special Automobile Model wrench is a tool kit in itself. Coe's quality costs slightly more, and it is worth many times the price of any other tool. A Coe's is always dependable, in the garage or on the road. Literature sent at request.

COE'S WRENCH COMPANY WORCESTER, MASS.

Distributors: { J. C. McCarty & Co., 21 Murray Street, } New York City
 { John H. Graham & Co., 113 Chambers Street, }



(When Writing to Advertisers Please Mention The Automobile Journal.)

THE THOUSAND DOLLAR CAR 1916-\$850

See This Unusual Show Display

It gives you your first opportunity to see and judge a car—not through the eyes of those who made it—but through the experience of *those who use it*. Hundreds of owners prove beyond a doubt the value of Inter-State power, comfort and beauty. No claims, no promises, no experiments—just honest, convincing *value testimony*.

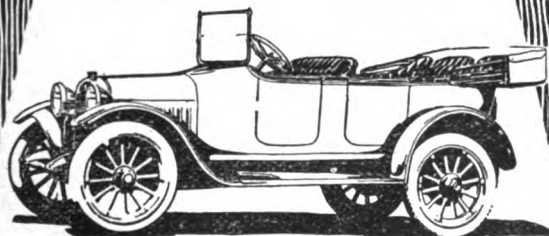


Take No Chances

Dealers and owners both will find here an idea far above any wonderful change in design and construction. If you want to know about *proved value* and *actual assets* for either the man who buys or sells cars—see us.

Space B-15 New York Show
Balcony Grand Central Palace

Inter-State Motor Co.
Muncie Indiana



Addressed to YOU,
Good Dealers,
Everywhere.

Gentlemen:—

Three thousand salesmen will assist you—without charge—in selling the Inter-State this season.

Look over your list of prospective buyers—

You don't have to tell them what we claim for this car's value—or what you claim!

Just call in the actual facts on value of 3,000 satisfied, enthusiastic owners of this car.

These unequaled sales facts in the form of definite records are a big feature of our show display.

They form the biggest, strongest and best profit proofs any dealer ever had.

They give you just the reasons you've needed and wished for, to make more sales—bigger business—greater profits.

Don't overlook the help of these 3,000 silent salesmen. Added to Inter-State Power, Comfort and Beauty, they mean the best dealer's proposition in the country. If you can't come to the factory get the evidence at the shows.

The proposition is big enough—strong enough—profitable enough—to merit quick and definite action on your part.

Get the details!

INTER-STATE MOTOR COMPANY,

B. M. Twyman
General Manager.

Muncie, Ind., Dec. 20, 1915.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

BOSTON MOTOR TRUCK SHOW

March 4-11, 1916

THE BOSTON SHOW EDITION OF MOTOR TRUCK

Will Be Mailed February 25

The Boston Exhibition will be the only show of motor trucks of national importance of the year.

The entire section of the country from which this show will attract visitors is covered by the ***Motor Truck*** practically to the exclusion of all other publications devoted to highway transportation.

Publicity in this edition will reach every interest, it will be complete publicity for one expenditure, and circulation will not be duplicated.

The last form will close February 21.

THE MOTOR TRUCK

TIMES BUILDING

PAWTUCKET, R. I.

CHICAGO
Show Number
of the
Accessory and
Garage Journal

Mailed January 20, 1916

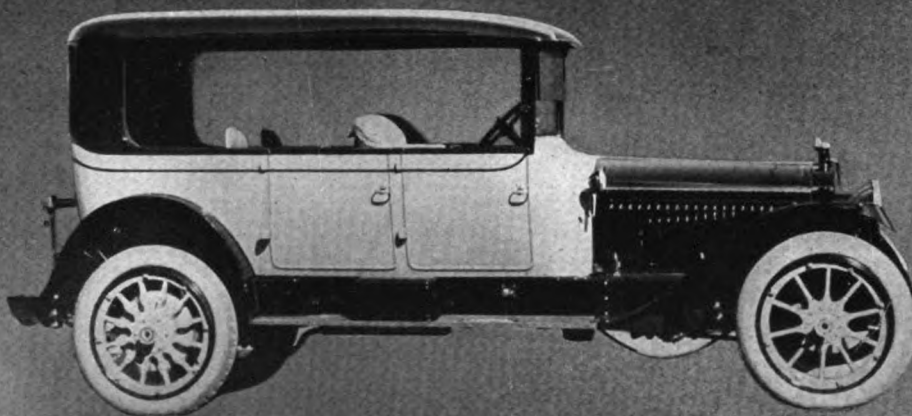
Guaranteed Circulation for this Edition
25,000 Copies

Guaranteed all trade—no readers among car owners.
Guaranteed to reach practically every buying and selling industrial interest in the field that the Chicago Show will draw from.

Last Form Closes January 16

Accessory and Garage Journal
Times Building, Pawtucket, R. I.

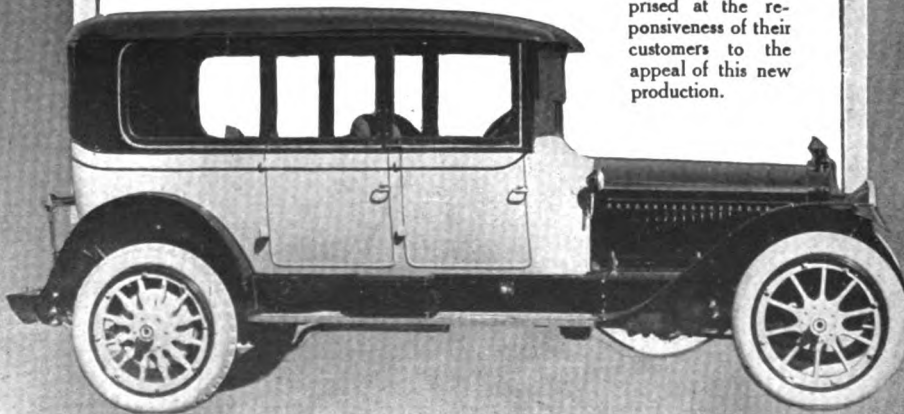
SPRINGFIELD CONVERTIBLE BODIES



THE limousine and the touring car are completely satisfactory only in certain seasons. The new Springfield Demi-Convertible body has no such limitations; it is the all-year, all purpose body.

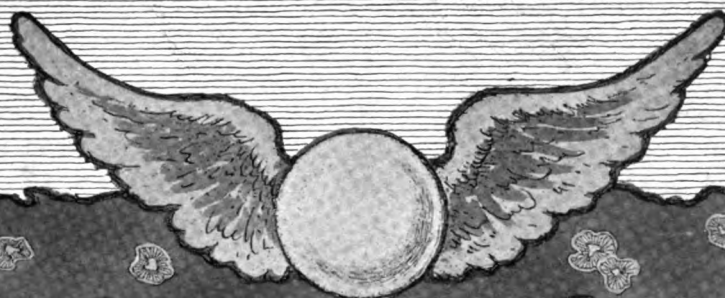
More and more in America, as in Europe, the tendency is to demand protection from the sun, the dust and sudden showers even in touring. This body with its permanent top provides such protection, while it gives plenty of air and an unobstructed view. It may be converted into a limousine.

Dealers will be surprised at the responsiveness of their customers to the appeal of this new production.



SPRINGFIELD METAL BODY Co.

SPRINGFIELD, MASS.



ANNOUNCEMENT

KING EIGHT

"CHALLENGER" MODEL E—SIXTY HORSE POWER
7-Passenger Touring : : : : : 5-Passenger Roadster

Price \$1350 Complete
F. O. B. DETROIT

With this new model the King Motor Car Company enters its second year as a builder of "Eights," after having been the *first* concern in America to manufacture and market a "popular-priced" eight-cylinder automobile. Thousands of the first KING "Eight" are now in operation the world over, there being *more* KING Eight-Cylinder Cars running than *any* other make save one.

The finely designed boat-line body of Model E has a grace, distinctiveness and finish beyond illustration, and while the new car's many points of engineering excellence require catalog enlargement, a suggestion of what it offers mechanically may be gathered from this brief mention of features: Motor bore and stroke, 3x5; aluminum pistons; improved King Cantilever suspension; 120-inch wheel base; emergency brake on transmission shaft; auxiliary seats folding out of sight; spiral bevel gears and vacuum gasoline system.

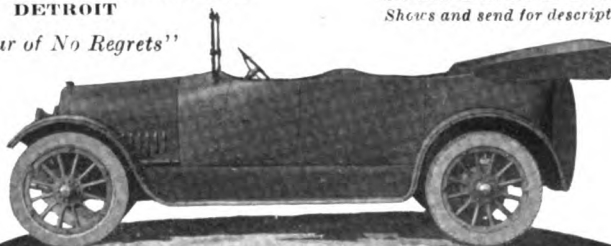
"RELIANCE" The Improved 5-Passenger Touring Model **\$1150**

40-45 Horse Power, Eight-Cylinder. The car which made the famous high gear tests on the Pacific Coast. 113-inch wheel base and 2 $\frac{7}{8}$ x5 V-type motor. Salon green. **Immediate delivery.**

KING MOTOR CAR COMPANY
DETROIT

See KING exhibit at the Automobile Shows and send for descriptive matter

"The Car of No Regrets"



Show Issues Automobile Journal

CHICAGO

Held January 22 to January 29

ADVANCE NUMBER
January 20 Issue

REVIEW
February 10 issue

BOSTON

Held March 4 to March 11

Display of Pleasure and Commercial Cars

ADVANCE NUMBER
February 28 Issue

REVIEW
March 10 Issue

Great Shows——Great Editions

Send Your Copy Today

AUTOMOBILE JOURNAL

TIMES BUILDING

PAWTUCKET, R. I.

AUTOMOBILE SCHOOL INSTRUCTION BOOKS

We are the largest publisher of books dealing with automobile mechanical subjects in America.

Our special books for automobile and technical schools have been adopted by more than 300 institutions.

Ten books constitute the school library series, each distinct, complete and fully illustrated.

The 1916 edition is now ready. This is the best and most comprehensive series ever published for students' use, and the most profitable and satisfying for schools to use.

Details and quotations at request.

Automobile Journal Publishing Company

Times Building,

Pawtucket, R. I.

Oakland

THE Oakland "8" is not alone responsible for the wave of Oakland sentiment that is sweeping the country. The complete line—8's, 6's, 4's,—has aroused car owners and dealers to a realization of the greatness of the Oakland car.

THE OAKLAND "8" is the big eight-cylinder leader. Seventy horsepower. High speed motor. Seven-passenger, with room for more. \$1585 f. o. b. Pontiac.

THE OAKLAND "6" A powerful light Six. 2100 pounds ready for the road. 30 to 35 horsepower. Five and two-passenger models, \$795, f. o. b. Pontiac.

THE OAKLAND "4" Famous high-speed motor Oakland. Simplicity and economy of the four with more smoothness in running than many sixes possess. Two-passenger Roadster and Speedster. Five-passenger Touring, \$1050, f. o. b. Pontiac.

8's, 6's, 4's, at New York and Chicago Shows

OAKLAND MOTOR CO., PONTIAC, MICH.

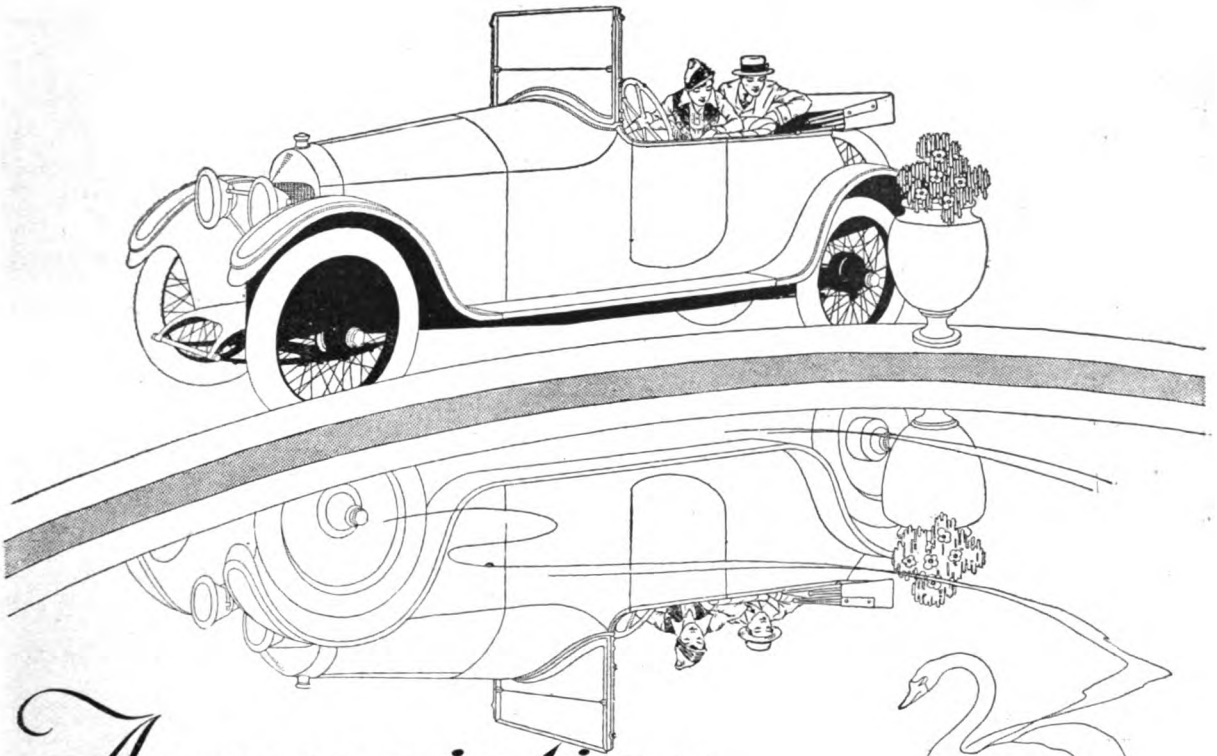
High Speed
Motor
Seventy
Horse-Power



DEALERS! This is a complete line—fours, sixes, eights—at popular prices—a line that enables you to satisfy every motor car demand. Catalog and dealer's contract sent on request.

Oakland Motor Company, Pontiac, Michigan

(When Writing to Advertisers, Please Mention The Automobile Journal.)



Appreciation

is a mental recognition of value, and is a reflected admiration of beauty or merit which precedes possession.

As only an artist can appreciate art and a musician music, so motor-car values can only be appreciated by those who, in motor cars, buy only world achievements.

The casual onlooker may admire a motor car, but appreciation in its finality is purchase-admiration measured in gold and silver by the man to whom motor-car perfection is a habit in his big car buying.

Scripps-Booth

luxurious light-weight cars are driven almost exclusively by owners of experienced motor-car judgment. These owners are the most appreciative of Scripps-Booth design and performance, and are widely responsible—through their enthusiasm concerning the car—for its remarkable sales in the most exclusive circles.

Scripps-Booth cars will win your appreciation when but given an opportunity through our nearest sales representative.

Scripps-Booth Company
Detroit, Mich.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

Buyers' Reference and Guide.

(Yearly Advertisers Only Are Listed in This Guide.)

ACCESSORY MANUFACTURERS AND JOBBERS.

Auto Parts Co., Providence, R. I.
Faw, J. H., Inc., 41 Warren St., New York City.
Times Square Auto Co., 56th St., at Broadway, New York City.

AIR COMPRESSORS AND TANKS.
Brunner Mfg. Co., Main Office and Factory, Utica, N. Y.; New York Office, Hudson Terminal Bldg., 30 Church St. (Brunner.)
Williams Foundry & Machine Co., Akron, O.

AIR PUMPS.

Gardiner Governor Co., 126 Williamson St., Quincy, Ill.
Lipman Air Appliance Co., 199 Pleasant St., Beloit, Wis. (Portable, Stationary.)

ANTI-RATTLERS.

King Specialty Mfg. Co., Brookline, Mass.

AUTOMOBILE ACCESSORIES.

Motorcycle Accessories Co., St. Paul, Minn.

AUTOMOBILES. (See Cars.)

AUTOMOBILE SPECIALTIES.

Motor Specialties Co., Waltham, Mass.

AUTO SPRINGS. (Boltless.)

Harvey Spring Co., 851 17th St., Racine, Wis.

AUTO STORAGE COVER.

Kennedy Car Liner and Bag Co., Shelbyville, Ind.

AXLES.

Russell Motor Axle Co., North Detroit, Mich. (Internal Gear Drive.)

BALLS AND BALL BEARINGS.

Ahlberg Bearing Co., 2624 Michigan Ave., Chicago; 1790 Broadway, New York City; 805 Woodward Ave., Detroit.
Marburg Bros., Inc., 1790 Broadway, New York. (S. R. O.)

New Departure Mfg. Co., Bristol, Conn. (New Departure.)

Norma Co. of America, 1790 Broadway, New York City. (Norma.)

BODIES—WOOD AND METAL.

Cotton, Inc., L. M., Boston, Mass.
Springfield Metal Body Co., 20 Medford Ave., Springfield, Mass.
BOLTLESS AUTO SPRINGS.
Harvey-Spring Co., 851 17th Street, Racine, Wis.

BRAKE BANDING OR LINING.

Standard Woven Fabric Co., Framingham, Mass. (Multibestos.)
Staybestos Mfg. Co., Lena and Armat Sts., Germantown, Philadelphia, Penn. (Staybestos.)

Thermoid Rubber Co., Trenton, N. J.
BRUSHES, WIRE.
Williams Foundry & Machine Co., Akron, O.

CABLE, AUTOMOBILE.

Faw, J. H., Inc., 41 Warren St., New York City. (Standard American.)

Packard Electric Co., The, Warren, O.

CARBON REMOVERS. (See Cylinder Cleaning Compound.)

CARBURETORS.

Zenith Carburetor Co., Detroit. (Zenith.)

CARS—GASOLINE PLEASURE.

Inter-State Motor Co., 804 West Willard St., Muncie, Ind. (Inter-State.)
Metz Co., Waltham, Mass. (Metz.)
Nordyke & Marmon Co., Indianapolis. (Marmon.)

Peerless Motor Car Co., Cleveland, O. (Peerless.)

Pierce-Arrow Motor Car Co., Buffalo, N. Y. (Pierce-Arrow.)

Reo Motor Co., Lansing, Mich.

Scripps-Booth Co., Detroit. (Scripps-Booth.)

Stutz Motor Car Co., Indianapolis. (Stutz.)

White Co., Cleveland, O. (White.)

Willys-Overland Co., Toledo, O. (Overland.)

Winton Co., 131 Berea Road, Cleveland, O. (Winton.)

CARS—GASOLINE COMMERCIAL.

Chase Motor Truck Co., 106 West St., Syracuse, N. Y.

Duplex Power Car Co., Charlotte, Mich. (Duplex.)

Federal Motor Truck Co., Junction and Leavitt Sts., Detroit. (Federal.)

Independent Motors Co., Port Huron, Mich. (Independent.)

International Motor Co., 64th St., and West End Ave., New York, N. Y. (Mack.)

Kissel Motor Car Co., 196 Kissel Ave., Hartford, Wis.

Locomobile Company of America, Bridgeport, Conn.

Packard Motor Car Co., Detroit, Mich.

Peerless Motor Car Co., Cleveland, O. (Peerless.)

Pierce-Arrow Motor Car Co., Buffalo, N. Y. (Pierce-Arrow.)

Reo Motor Co., Lansing, Mich.

Signal Motor Truck Co., Detroit. (Signal.)

Sullivan Motor Car Co., Rochester, N. Y. (Sullivan.)

White Co., Cleveland, O. (White.)

CARS—ELECTRIC COMMERCIAL.

Baker R & L Co., Cleveland, O.

General Vehicle Co., Long Island, N. Y.

CEMENTS.

International Metal Polish Co., Indianapolis, Ind.

CHAINS, TIRE AND ANTI-SKIDGING DEVICES.

Weed Chain Tire Grip Co., 28 Moore St., New York City. (Weed.)

CIGAR LIGHTERS. (See Lighters.)

COILS.

Heinze Electric Co., Lowell, Mass.

CONTROLLERS.

Pierce Speed Controller Co., Anderson, Ind.

CRANK HOLDERS.

King Specialty Co., Brookline, Mass. (King.)

CYLINDER CLEANING COMPOUND.

Dyer Apparatus Co., Cambridge, Mass. (Oxy-Carbon.)

ELECTRIC LIGHTING EQUIPMENT.

Carleton Co., The, 172 Summer St., Boston. (New Carleton No. 68.)

Culver-Stearns Mfg. Co., Worcester, Mass.; Detroit.

ELECTRIC TROUBLE SHOOTER.

American Bureau of Engineering, 1526 Wabash Ave., Chicago, Ill. (Ambu.)
ENGINES, GAS, GASOLINE, KEROSENE.
Manufacturers' Engine Company, Kansas City, Mo.

FAN BELTS.

Housel Sales Co., B Street, Buffalo, N. Y.

FORD GASOLINE GAUGES.

Housel Sales Co., B Street, Buffalo, N. Y.

FORD HOODS AND RADIATORS.

Superior Lamp Mfg. Co., 136 W. 52nd St., New York, N. Y.

FORD STARTERS.

Hunter Auto Supply Co., Hunter Bldg., 333 W. Madison St., Chicago, Ill. (Hunter.)

Picard, A. J., & Co., 1720 Broadway, New York City. (Genemotor.)

Walden Mfg. Co., 73 Commercial St., Worcester, Mass.

FOUR WHEEL DRIVE.

Four Wheel Drive Auto Co., Clintonville, Wis.

FUNNELS, AUTO.

Dover Stamping & Manufacturing Co., Cambridge, Mass. (Dover.)

GAS ENGINES.

Manufacturers' Engine Company, Kansas City, Mo.

GASOLINE ENGINES.

Manufacturers' Engine Company, Kansas City, Mo.

GEAR SETS.

Detroit Radiator Specialty Co., 961 Woodward Ave., Detroit, Mich.

GEARS, STEERING.

Ross Gear & Tool Co., 794 Heath St., Lafayette, Ind. (Ross.)

GENERATORS.

Carleton Co., The, 172 Summer St., Boston. (New Carleton No. 68.)

HEATERS.

Superior Mfg. Co., N. S. Pittsburg, Penn. (Superior Safe Garage.)

HORNS.

Faw, J. H., Inc., 41 Warren St., New York City. (Clero.)

Fitzgerald Mfg. Co., 101 Oliver St., Torrington, Conn. (Clero.)

Seiss Mfg. Co., 444 Dorr St., Toledo, O.

HOSE CLAMPS.

Faw, J. H., Inc., 41 Warren St., New York City. (Ideal.)

IGNITION ASSEMBLIES.

Faw, J. H., Inc., 41 Warren St., New York City.

INSULATION.

Packard Electric Co., The, Warren, O.

JACKS.

Motor Specialties Co., Waltham, Mass. (Excel Auto.)

KEROSENE ENGINES.

Manufacturers' Engine Company, Kansas City, Mo.

LAMPS.

Faw, J. H., Inc., 41 Warren St., New York City.

Mabey's Electric & Mfg. Co., Indianapolis. (Mabey's Electric Trouble.)

Mueller & Co., R. S., 431 High Ave., S. E., Cleveland, O. (Clamp.)

LIGHTERS, CIGAR.

Mabey's Electric & Mfg. Co., Indianapolis. (Mabey's Electric.)

BUYERS' REFERENCE and GUIDE—Continued.**LIGHTING SYSTEMS, ELECTRIC.**

Carleton Co., The, 172 Summer St., Boston. (New Carleton No. 68.)

Faw, J. H., Inc., 41 Warren St., New York City. (Culver Stearns.)

Hawthorne Mfg. Co., Inc., 5 Spruce St., Philadelphia, Penn. (Spotlights, Fine Searchlights, Pencil Flashlights)

Xcel-O-Lyte Co., 1200 Xcelo Bldg., New-ten, Ia.

LIGHT PROTECTORS.

Faw, J. H., Inc., 41 Warren St., New York City. (Lennon.)

LUBRICANTS.

Dixon Crucible Co., Jos., Jersey City, N. J. (Graphite.)

Eagle Oil & Supply Co., 104 Broad St., Boston. (Eagleine No-Karbon.)

New York & New Jersey Lubricant Co., 165 Broadway, New York. (MotoRol, Non-Fluid, Kejex.)

Standard Oil Co., New York. (Polarine.)

Texas Company, 17 Battery place, New York City. (Texaco.)

Valvoline Oil Co., 27 State St., Boston. (Valvoline.)

MAGNETO COVERS.

Heinze Electric Co., Lowell, Mass.

MAGNETOS AND SUPPLIES.

Bosch Magneto Co., 204 W. 46th St., New York.

Eisemann Magneto Co., 32 33d St., Brooklyn, N. Y.

Marburg Bros., 1790 Broadway, New York. (Mea.)

Spittdorf Electrical Co., 98 Warren St., Newark, N. J.

MAILING LIST.

Trade Circular Addressing Co., 166 W. Adams St., Chicago.

MANIFOLDS. (Intake and Exhaust)
Wilmo Co., 208 So. La Salle St., Chicago, Ill.

MEASURES.

Dover Stamping & Manufacturing Co., Cambridge, Mass. (Auto and Savol.)

MOTORS.

Buda Co., Harvey, Ill.

Waukesha Motor Co., Waukesha, Wis.

Wisconsin Motor Mfg. Co., Milwaukee, Wis.

PISTON RINGS.

Featherweight Piston Company, 11 Guyman Way, Pittsburgh, Penn.

McQuay-Norris Mfg. Co., Dept. D, St. Louis, Mo. (Leak-Proof.)

PISTONS, ALUMINUM ALLOY.

Featherweight Piston Co., 11 Guyman Way, Pittsburgh, Penn.

POLISHES.

International Metal Polish Co., Indianapolis, Ind.

PRESSES. (See Arbor Presses.)

PUMPS, VALVE.

Hill Pump Valve Co., Chicago, Ill.

RADIATORS.

Rome-Turney Radiator Co., Rome, N. Y. (Helical Tube.)

RADIATOR CEMENT. (See Cements.)

RADIATOR & HOOD COMBINATIONS.

Superior Lamp Mfg. Co., 136 W. 52nd St., New York, N. Y.

REAMERS.

Harding Distributing Co., Boston. (Martell Aligning.)

REAR APRONS FOR FORDS.

Housel Sales Co., B Street, Buffalo, N. Y. (Gibmil.)

REBORING CYLINDERS.

Motorcycle Accessories Co., St. Paul, Minn.

RINGS. (See Piston Rings.)

ROAD BUILDING MATERIALS.

Barrett Manufacturing Co., New York. (Tarvia.)

ROLLER BEARINGS.

Hyatt Roller Bearing Co., Detroit. (Hyatt.)

Norma Co. of America, 1790 Broadway, New York City. (Norma.)

SELF-STARTERS. (See Motor Starters.)

SHOCK ABSORBERS AND SUPPLEMENTARY SPRINGS.

Hartford Suspension Co., 147 Morgan St., Jersey City, N. J.

SPARK PLUGS AND IGNITERS.

Bosch Magneto Co., 204 W. 46th St., New York.

Faw, J. H., Inc., 41 Warren St., New York City. (Red Seal.)

Gibson-Hollister Mfg. Co., Boston, Mass.

Hartford Machine Screw Co., 512 Capitol Avenue, Hartford, Conn. (Master.)

Heinze Electric Co., Lowell, Mass.

Milwaukee Auto Specialty Co., 705-711 Chestnut St., Milwaukee, Wis. (Centerfire.)

Spittdorf Electrical Co., 98 Warren St., Newark, N. J.

Superior Motor Power Company, 24 Irving Place, New York City.

SOAPS.

International Metal Polish Co., Indianapolis, Ind.

SPEEDOMETERS.

Standard Thermometer Co., Boston, Mass.

SPRING OILERS.

Housel Sales Co., B Street, Buffalo, N. Y.

SPRINGS FOR AUTOMOBILE SUSPENSION.

Marburg Bros., Inc., 1790 Broadway, New York. (Marburg-Hagen.)

Tatthill Spring Co., 756 Polk St., Chicago. (Titanic Unbreakable.)

TEST CLIPS.

Mueller & Co., R. S., 431 High Ave., S. E., Cleveland, O. (Universal.)

THERMOS CASES.

Dover Stamping & Manufacturing Co., Cambridge, Mass.

TIMERS.

Motor Specialties Co., Waltham, Mass. (Bemus.)

TIRE CHAIN GRIPS. (See Chains.)

TIRE REPAIR OUTFIT.

C. A. Shaler Co., 252 Fourth St., Wau-pun, Wis.

TIRES, CASINGS AND INNER TUBES.

Federal Rubber Mfg. Co., Milwaukee, Wis. (Federal.)

TIRE SEALS.

Jos. A. Vogel Co., Wilmington, Del. (Jovo Rapid Air Tite Tire Seal.)

TIRE TOOLS.

Housel Sales Co., B Street, Buffalo, N. Y.

TOPS AND ATTACHMENTS.

Springfield Metal Body Co., 20 Medford Ave., Springfield, Mass.

TRACTORS.

Knox Motor Associates, Springfield, Mass. (Knox.)

TRANSFORMERS.

Packard Electric Co., The, Warren, O.

TRUCKS AND TRACTORS. (See Cars, Commercial.)

VALVE GRINDING COMPOUND.

Faw, J. H., Inc., 41 Warren St., New York City. (Eureka.)

VULCANIZERS.

Mabey's Electric & Mfg. Co., Indianapolis. (Mabey's Electric.)

Vanderpool Co., Springfield, O.

Williams Foundry & Machine Co., Akron, O.

WARNING SIGNALS.

Seiss Mfg. Co., 444 Dorr St., Toledo, O.

WELDING OUTFITS.

Dyer Apparatus Co., Cambridge, Mass. (Dyer.)

Prest-O-Lite Co., Indianapolis, Ind.

Searchlight Co., 1012 Karpen Bldg., Chicago, Ill.

Waterhouse Welding Co., 3 Pelham St., Boston, Mass.

WRENCHES AND COMBINATION OUTFITS.

Coss Wrench Co., Worcester, Mass.

Faw, J. H., Inc., 41 Warren St., New York City. (Walden.)

Lane, Will B., 180 No. Dearborn St., Chicago. (Unique Ratchet.)

Mossberg Co., Frank, Attleboro, Mass.

Walden Mfg. Co., 73 Commercial St., Worcester, Mass.

World's Roadrace
Champion

World's Speedway
Champion

World's
Long Distance Records
250mi-300mi-350mi

Consistency
4 Consecutive
1sts & 2nds

STUTZ

World's Champion

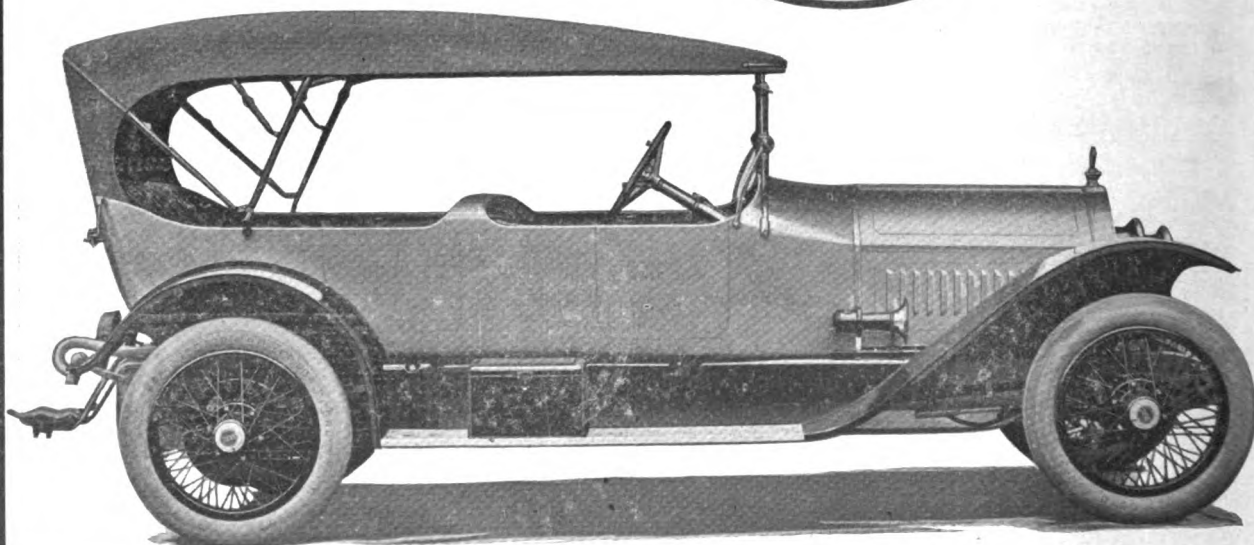
Stutz consistent victories are indisputable evidence of the inherent stamina, stability and reserve power that make Stutz America's premier road car—as well as World's Racing Champion.

Added to this mechanical excellence are body lines of distinction and refinement. Driving a Stutz, in addition to the prestige its reputation warrants, you enjoy the maximum in comfort, response and performance.

*Five Models—\$2,000 to \$2,550 f. o. b.
Indianapolis. Informative literature
on request.*

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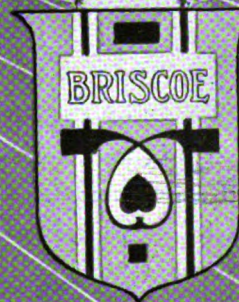
**Indianapolis,
Indiana**



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ELECTRIC STARTING AND LIGHTING SYSTEMS



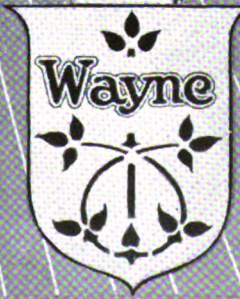
In superior electric starting and lighting essentials, the

SPLITDORF-APELCO

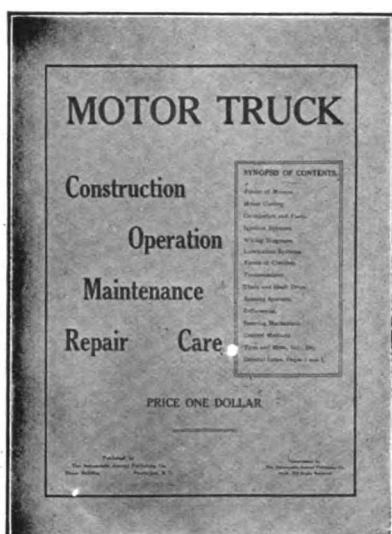
Electric Starting and
Lighting System

has made an enviable name for itself wherever in use. Backed up by a SERVICE TO THE USER, available at each and every branch house, a SPLITDORF-APELCO equipment means *entire satisfaction to the owner.*

Splitdorf Electrical Company
The Apple Electric Company
NEWARK, N. J.



(When Writing to Advertisers, Please Mention The Automobile Journal.)



A work that is complete, wholly practical and deals with all subjects as the title implies.

Truck Care
Truck Repair
Truck Operation
Truck Maintenance
Truck Construction
Prepared for
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Operators
Repairmen
Salesmen

\$1.00 the copy. In combination with a yearly subscription to Motor Truck (the great national authority on highway transportation, issued monthly) \$2.00.

This is the only book published dealing with business wagons, it is fully illustrated and represents a wonderful value.

MOTOR TRUCK

Times Building, Pawtucket, R. I.

Index to Advertisers.

	Page
Ahlberg Bearing Company.....	71
American Chain Co., Inc.....	32
Barrett Manufacturing Co.....	79
Bosch Magneto Company.....	71
Briscoe Motor Co.....	6-7
Coes Wrench Co.....	12
Cole Motor Car Co.....	2-3
Consolidated Car Co.....	Cover
Culver-Stearns Mfg. Co.....	74
Dayton Eng. Lab. Co.....	8
Dixon Crucible Co., Jos.....	70
Dorsey Mfg. Co.....	9
Dover Stamping & Mfg. Co.....	72
Eagle Oil and Supply Co.....	28
Eisemann Magneto Co.....	69
Gulf Refining Co.....	31
Hartford Machine Screw Co.....	73
Hartford Suspension Co.....	1
Heinze Electric Co.....	72
Inter-State Motor Co.....	13
King Motor Car Co.....	17
Marburg Bros.....	72
McQuay-Norris Mfg. Co.....	70
Mea Magneto Co.....	72
Mecca Mfg. and Spec. Co.....	26
Metz Company.....	74
Mossberg Co., Frank.....	77
National Auto Show.....	76
New Departure Mfg. Co.....	72
Nordyke & Marmon Co.....	79
N. Y. & N. J. Lubricant Co.....	70
Oakland Motor Co.....	20
Pathfinder Co., The.....	29
Peerless Motor Car Co.....	74
Pierce-Arrow.....	Cover
S J R Motor Co.....	Cover
Scripps-Booth Co., The.....	21
Seiss Mfg. Co.....	79
Splitdorf-Apelco Co.....	25
Splitdorf Electrical Co.....	4-5
Springfield Metal Body Co.....	16
Standard Oil Co., The.....	75
Standard Woven Fabric Co. Cover	
Staybestos Mfg. Co., The.....	78
Stutz Motor Car Co.....	24
Superior Mfg. Co., The.....	74
Texas Oil Company.....	79
Thermold Rubber Co.....	71
Times Square Automobile Co.....	26
Tuttle & Bailey Mfg. Co.....	70
Valvoline Oil Company.....	79
Vanderpool Co., The.....	26
Willys-Overland Co.....	27

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In Automobiles, Accessories and Supplies. Selling Prices Lowest in the World. Send for our Latest Price Wrecker and Save Money.

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A Distinct Trade Publication

Guaranteed to Have an Exclusive Trade Reader Distribution of

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Each Monthly Issue

Without a Competitor in Its Field

Detailed Advertising Information at Request

Accessory and Garage Journal
Times Building, Pawtucket, R. I.



SIX
Model 86

A Comparison of Values

Compare the Overland Six with the Six cylinder cars your competitors sell.

Go over the comparative specifications point by point.

You will find that in proportion to the price the Overland gives more than any other Six ever built.

It is a bigger car—*seats 7 passengers comfortably.*

The wheelbase is longer—*125 inches.*

Tires are bigger—*35 x 4½ inches.*

The motor is smoother and more powerful—*45 horsepower, latest en bloc design.*

The rear springs are longer and underslung.

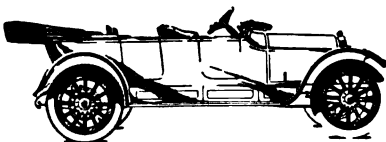
The finish is more lustrous.

The control buttons on steering column are more convenient.

Specifications throughout are those of a thoroughly high grade car. Yet the price is only \$1145.

It is the most impressive value offered in a six-cylinder car.

The Willys-Overland Co.
Toledo, Ohio



Overland Model 86, Six Cylinder Touring Car
Price - - \$1145, f. o. b. Toledo

"Made in U. S. A."



EAGLEINE AUTO OIL

WHY NOT USE IT?

To obtain the greatest efficiency from their cars owners must discriminate in buying lubricants. Those who get most from their cars demand Eagleine Auto Oil and will accept no other.

Thousands of letters from users of Eagleine testify that it gives a greater mileage, that no other oil lubricates so thoroughly, and that carbon troubles are reduced to the minimum.

It Suits but does not Soot

Eagleine Auto Oil is a trade marked and guaranteed brand sold in sealed containers and in quantities to meet the requirements of all owners. Eagleine Auto Oil eliminates all usual motor troubles and is supplied in grades adapted to every type of motor.

All good dealers recommend and sell Eagleine Auto Oil. It costs no more and it saves enough in upkeep expense to make it the best investment an owner can find.

We have a book of letters from owners that will surprise you. It deals with oil economy. Mailed on request.

EAGLE OIL AND SUPPLY COMPANY

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NEW YORK
Woolworth Building

CHICAGO
1132 West 37th Street

Pathfinder

the "GREAT"

King of Twelves

WE solicit this test, knowing that it is the most severe to which any motor car can be subjected—

To fully appreciate what has actually been accomplished in "Pathfinder the Great," it will be necessary for you to recall all the best features of all the best cars you have known, either in this country or in Europe, and then to combine these features into an imaginary car which shall constitute your ideal.

"Pathfinder the Great" should then be required to out-perform this ideal car in actual demonstration—point by point.

We stake our established reputation as builders of quality cars on "Pathfinder the Great's" ability to set a new standard of motor car efficiency in hill climbing, acceleration, flexibility, speed range "in high" and general road-worthiness—all of which is made possible by the remarkable twelve-cylinder, valve-in-head construction of the Pathfinder motor together

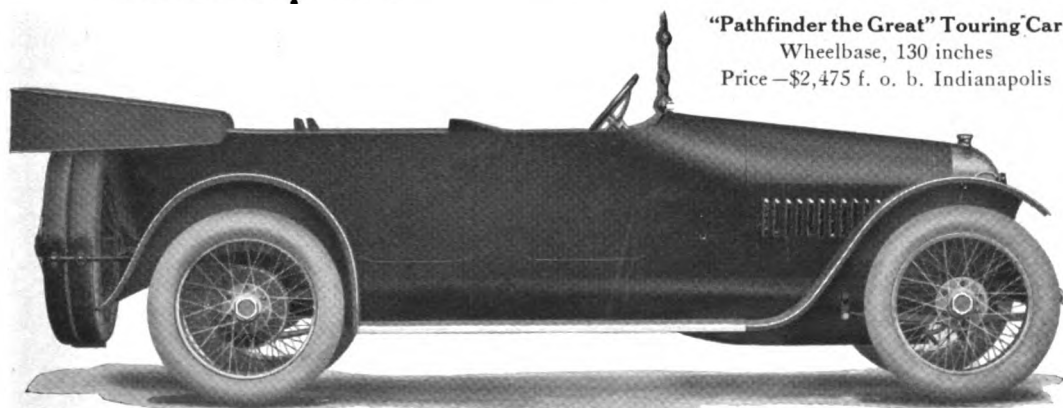
with the perfect co-ordination of all its units. From a standpoint of eye appeal, "Pathfinder the Great" is a poem in steel—one of the most ultra-beautiful and sumptuous cars ever built. The materials and workmanship employed in the making of "Pathfinder the Great" are, without exception, super-standard.

The full PATHFINDER line of models, including "Pathfinder the Great," will be exhibited at the New York and Chicago shows.

Literature and information on request.

Deliveries on "Pathfinder the Great" now being made by our dealers

The Pathfinder Company
Indianapolis, U. S. A.



"Pathfinder the Great" Touring Car
Wheelbase, 130 inches
Price—\$2,475 f. o. b. Indianapolis

(When Writing to Advertisers, Please Mention The Automobile Journal.)

NEW YORK

CHICAGO

BOSTON

DETROIT.

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Ten cents a copy.

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Order, or Registered Letter.
Money enclosures must
be at sender's risk.

William H. Black, Treasurer.

AUTOMOBILE JOURNAL PUB. CO.

Published the 10th and
25th of Each Month.

D. O. Black, Jr., Secretary.

Times Building, Pawtucket, R. I.

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VOL. XL.

DECEMBER, 25, 1915.

NO. 10.

PUBLISHER'S AND READERS' PAGE.

This issue is the Advance Number of the New York Automobile Show. It contains nearly twice the usual number of pages and without any additional cost to the subscribers. Its special features supply a comprehensive survey of all the outstanding features that will attract the largest proportion of attention at the exhibition. In addition to these articles, the regular departments are also included. The following issue, that of Jan. 10, will contain complete reviews of the show and also will present advance information relating to the Chicago show.

The Magnitude of the Motor Vehicle Industry, as shown by the statistics presented on page 3 of this issue, is astounding. During the past few months much speculation as to its size has been rife in the public prints. Now Alfred Reeves, an authority whose estimates must be given earnest consideration, presents the actual facts as they have been reported to the association of which he is the general manager. In the realm of prophecy there is none who can approximate as closely as can he, in regard to matters relating to the manufacture and distribution of motor vehicles.

The Serial dealing with the Ford Car Chassis has entered a new phase, the practical upkeep of the machine. While this story concerns only the Ford model T, there are many statements of truth that owners of other makes of machines can beneficially adapt to their problems. One of these is the state-

ment that "more automobiles are deteriorated through neglect or abuse than from normal use." In fact, this installment provides excellent opportunity for all motor car owners to obtain some very valuable advice and information.

Indicative of the importance of motor car accessories and supplies in the present status of the industry is the statement that at the New York Show there will be more than 307 accessory manufacturers exhibiting. The Editor of The Automobile Journal has been aware that the subscribers are much interested in the practical and moderately priced accessories and has devoted considerable space to editorial descriptions of representative articles. If any subscriber desires special information it will be supplied promptly if a letter is addressed to the Mechanical Editor. Apropos to this subject, it is suggested that subscribers carefully read the Buyers' Reference and Guide, which supplies the names and addresses of manufacturers, who will gladly send information regarding their products to all inquirers mentioning this magazine in their letters.

Partial Table of Contents.

	Page
*America's Greatest Show.....	1
*Multi-Cylinder Motors for 1916.....	5
*Some New Models at the Show.....	13
*New Seven-Passenger King Eight.....	17
*New S. J. R. Light Weight Model....	20
*Low-Priced Fours at the Show.....	21
*Motor Starting and Car Lighting.....	25
*General News of the Industry.....	29
*The Owen Magnetic Car a Novelty....	33
*A Revolutionary Design from Ireland..	37
*Body Features for 1916.....	41
*The Cutler-Hammer Gear Shift.....	47
*The Hartford Electric Brake.....	49
*Practical Motor Car Repairs.....	51
*Suggestions for the Ford Car Owner..	56
*Car Accessories and Equipment.....	61
*Remy Distributors for Multiple Cylinders	65
*New Briscoe "Twenty-Four" Announced	67
*Practical Facts for New Car Owners..	68

*Indicates article is illustrated.

Practical Suggestions, a regular feature of The Automobile Journal are more numerous in this issue than has been usual. The Editor finds that these, both in the Practical Motor Car Repairs and the New Car Owners departments, supply just the information that the majority of readers want. The Mechanical Editor will promptly supply any special information.

Flows

Freely at Zero

Starts with the engine

THIS feature in an oil is of greater importance than you might think.

90% of the automobiles use Medium oil in the Summer—many change to a lighter weight oil in Winter upon

the recommendation of dealers who do not sell a Medium oil that flows freely at Zero.

Now,—the internal heat of your motor is just as great in Winter as in the Summer—hence, if Light oil is not the proper lubricant for Summer, *it is not the proper lubricant for Winter.*

A great many of the Light Motor oils thin out to such an extent from engine heat, that they are no better lubricants than Kerosene.

You therefore take chances if you shift to a Light oil for Winter motoring.

SUPREME AUTO OIL *Flows Freely at Zero.*

The coldest weather will not prevent its giving the most efficient lubrication, *for the reason that it contains no paraffine* to thicken under cold.

You may use the same grade of SUPREME AUTO OIL Winter and Summer.

SUPREME AUTO OIL produces less carbon, due to the fact that it contains no paraffine to gum and stick. The free carbon is blown out with the exhaust.

**There is More Power in
THAT GOOD GULF GASOLINE and
SUPREME AUTO OIL.**

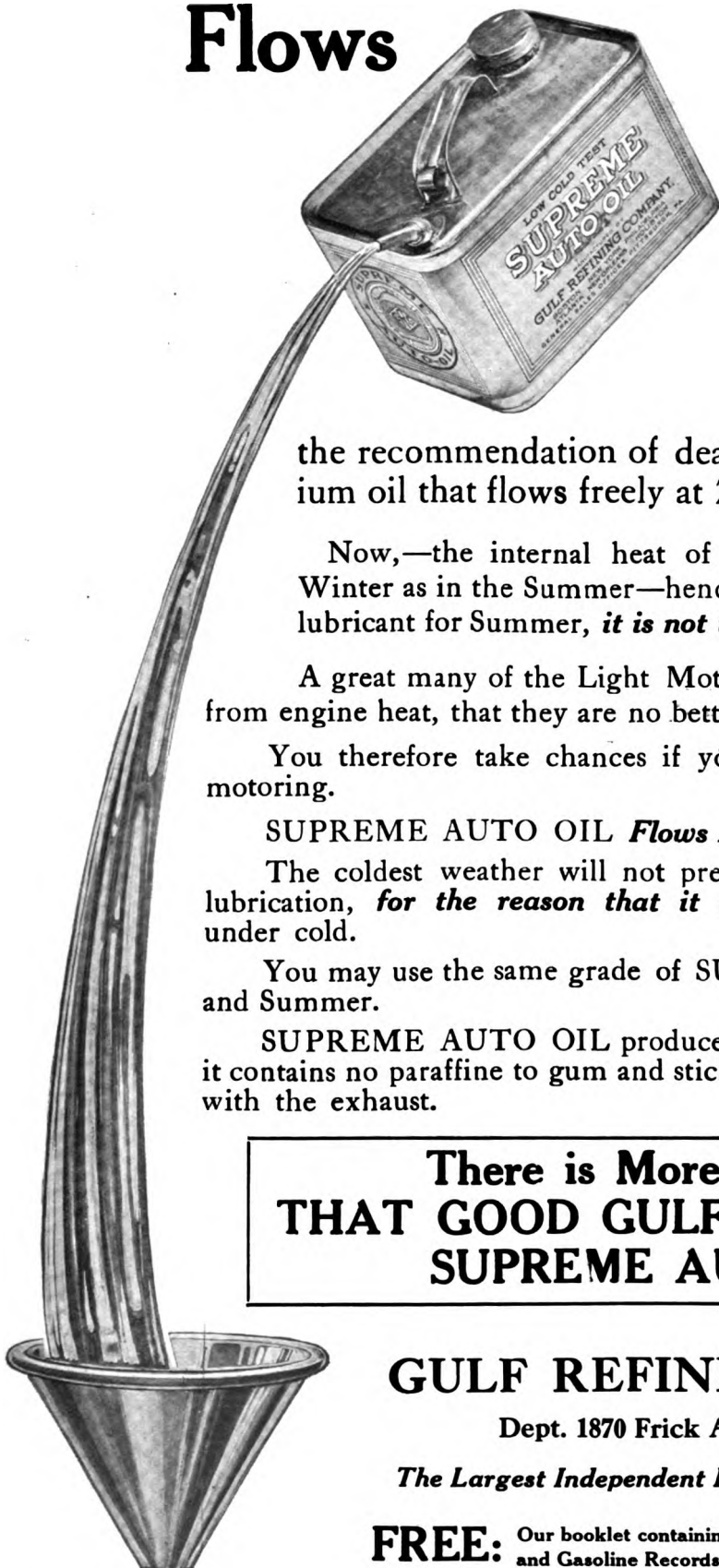
GULF REFINING COMPANY

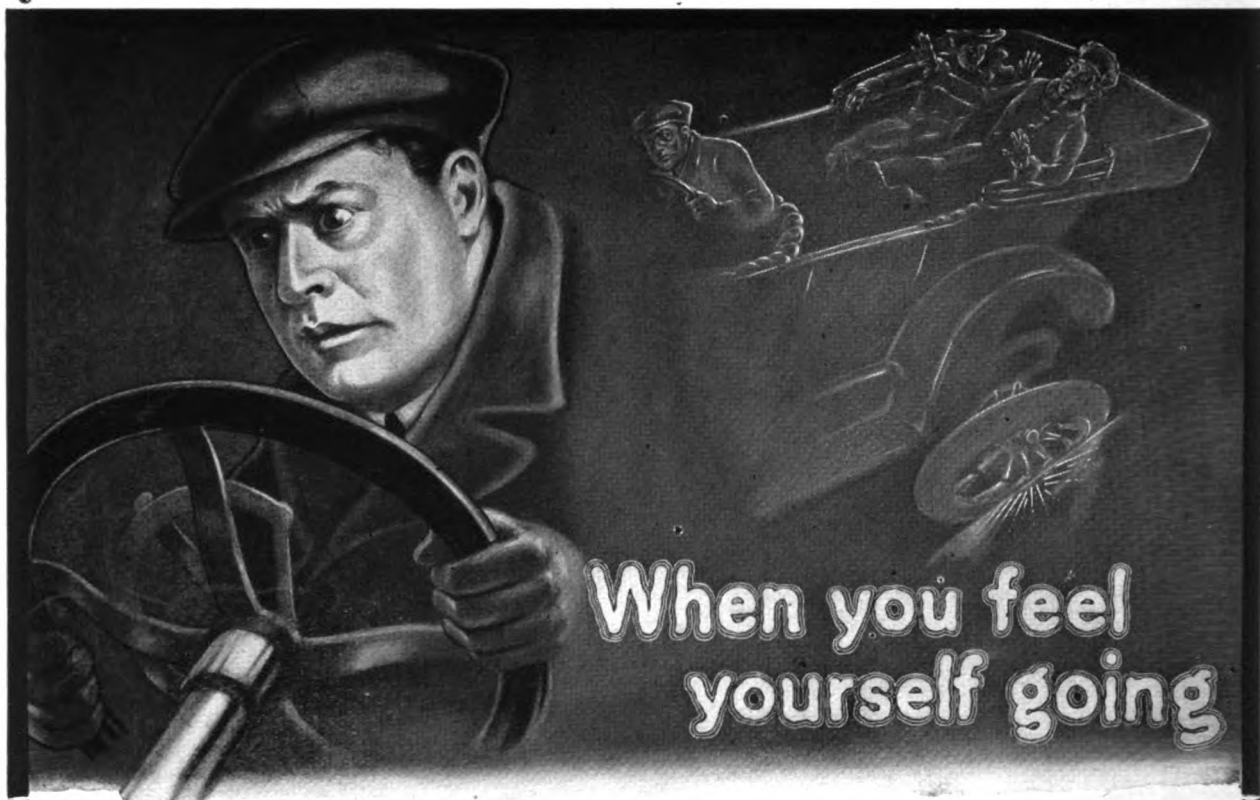
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The Largest Independent Refining Company in the World

FREE: Our booklet containing illustrated charts of Engine Details, Tire and Gasoline Records, and hints on Lubricating sent on request.

(When Writing to Advertisers Please Mention The Automobile Journal.)





WHEN you feel your car skid—that feeling of utter helplessness with its attendant fear of disastrous consequences—it will be too late to do anything, except pray. No amount of human skill will then avert a crash against the curb, a nearby vehicle, or, worse yet, the innocent bystander.

But you don't have to suffer that terrible "feeling of utter helplessness". Appreciate *now* that the only thing to do is to use the dependable preventative—**Anti-Skid Chains on all four tires.**

Weed Anti-Skid Chains

The Only Real Safeguard Against Skidding

"**Safety First**" means taking precautions rather than depending entirely on skillful driving, and experience teaches that Weed Chains are an absolute necessity for the expert as well as for the novice.

Procrastination is answerable for most of the skidding accidents. When a motorist is afflicted with this disease he usually says: "I'll wait until 'tomorrow' before buying Weed Chains"; or if his car's equip-

ment includes Chains, he doesn't think of using them until he "feels a skid", and then, as we said before, it's too late to do anything, except pray.

Don't suffer that agonizing anticipation of "feeling a skid" with its attendant fear of disastrous consequences. Enjoy that "**safe feeling**". Take the necessary "**stitch in time**"—put **Weed Chains on all four tires at the first indication of slippery going.**



American Chain Co. Inc., Bridgeport, Conn.

Sole Manufacturers of Weed Anti-Skid Chains

Also Manufacturers of Tire Chains especially constructed for Single and Dual Solid Truck Tires—Motorcycle Tire Chains, Dobbins Blow-Out Chains, etc.

Manufactured for Canada by DOMINION CHAIN COMPANY, Limited, Niagara Falls, Ontario, Canada



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THE Automobile Journal

AMERICA'S GREATEST SHOW

DECEMBER 25TH 1915

VOL. XL. NO. 10

\$1.50 THE YEAR



Grand Central Palace
New York



IN ALL the amazing history of the motor vehicle business in America there has been no year that approached in any respect the one just closing, and none has ever held such promise of business in such great volume as does the year 1916.

The first of the great national automobile shows, which opens at the Grand Central Palace, New York City, on New Year's Eve, will fittingly usher in this exceptional year. More cars representing more makers than have ever before shown their wares there will be present. Eighty car producers in all will take part.

An equally unusual number of accessory makers will also have displays in the great building. Some of these had exhibits at the show years ago and discontinued them for some years, only to resume the exhibit at this time of great prosperity. Others have for the first time found their business moving in sufficient volume to make the display worth while. And there are a number,

too, who have been regularly represented at the shows for the past 10 years or more.

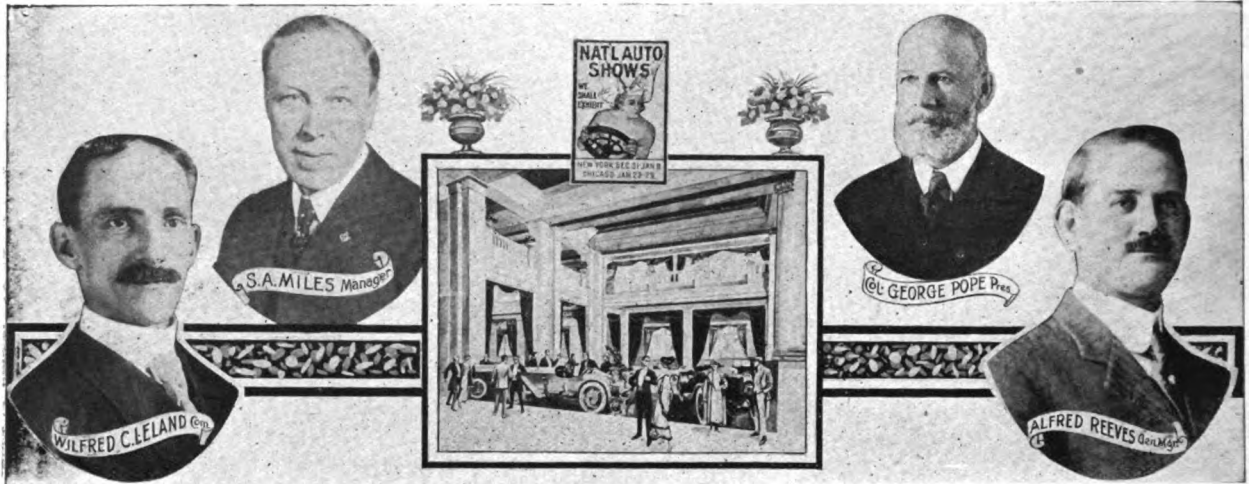
This is the 16th annual New York show under the auspices of National Automobile Chamber of Commerce. Manager S. A. Miles, who is responsible for the scheme of interior decoration, declares that the theme is to be the interior of the Palace of Motoria, a goddess invented to preside over the destinies of the motor car.

Miles of Maroon Velvet.

In decorating the interior 25,000 yards of maroon velvet, festooned in blue and gold are used, set against the splendid Doric and Corinthian marble columns, which are permanent parts of the building. The result is brilliant, but not garish.

On the main floor the 20 imposing Corinthian columns, which form the central court, are to be treated with valances, or hangings, of deep blue draped from the bays between the columns and held at the base in a rich and handsome effect





Mammoth chandeliers of original design will be the chief source of illumination. Each has 18 high power lights behind frosted glass, and in addition there will be glass of many colors to make them a flare of brilliant color. These are suspended from the ceiling by heavy chains, which will be draped with foliage.

Above the heavy marble columns the upper cornice, which forms the railing of the second, or mezzanine, floor, is to be interlaced with flowers of many tints. On this floor are 119 Doric columns, and these will be treated with Renaissance figures and pergola effects. Handsome signs attached to the columns will give the names of the exhibitors in the various sections.

The lobby of the Grand Central Palace is exceptionally impressive in itself, but the effect has been heightened by the use of great maroon portieres that partly screen the gigantic display of cars and the magnificent decorations beyond. On the main floor tubular electric lights are used to mark the names of the cars in the various spaces.

The decorations are the work of M. A. Singer, who has decorated several of the previous New York shows.

Cars and Accessories Only.

This year there will be no motorcycles in the show—they were displayed at a special show in the late summer. Motor trucks will also be absent. The show, however, will be important for truck buyers, as well as for those interested only in passenger cars.

When truck show week followed the passenger car exhibit many dealers who handle both lines had either to wait over a week to see the trucks or they had to make two trips to New York. It is simpler to have one show and to examine the trucks either at the show rooms of the New York dealers or in actual service in and

about New York. Consequently, truck representatives will be fully as busy as their passenger car brethren at the display during the week.

With the entire 150,000 feet of space taken up by passenger cars and passenger car accessories, the show will be larger and will more thoroughly cover the subject than that at any exhibit previously held. Of the 307 accessory firms who will show, 48 are new comers.

The technical men will be interested chiefly in the chassis of the new multi-cylinder cars, and also of the very low priced light cars, which have been presented in such profusion during the past year.

As always at automobile shows, the body work will be of perhaps the greatest interest to the public. Some very finely upholstered and finished jobs will be on display. Great interest is sure to be aroused by the numerous four-passenger roadsters with their divided front seats, and the seven-passenger open and closed cars, which have been designed on the same principle.

S. A. Miles, the manager of the show, directs it this year for the third time. Others on the committee who have been active in the work of preparing the show are Alfred Reeves, general manager of the National Automobile Chamber of Commerce; Wilfred C. Leland, who was active also on last year's committee, and Colonel George Pope, chairman of the show committee.

It is probable that nearly half a million people will pass through the doors of the palace to examine the displays. They will come from all parts of the East, at least as far as the Allegheny mountains, while those farther West will generally wait for the Chicago show. Close to a million dollars will be spent during the week by show visitors in New York City restaurants, hotels, theatres and in other ways.

FACTS CONCERNING THE INDUSTRY.

THE tremendous growth of the automobile industry during the past few years has made it the most talked about of all American industries. Men everywhere have been amazed at the speed and magnitude of its development, and automobile statistics have become current coin of conversation.

Here are figures that tell the whole wonderful industrial romance. They have been compiled by Alfred Reeves, general manager of the National Automobile Chamber of Commerce. He is not only one of the best informed men in the industry, due to his long association with it, but as an official of the association, has access to the confidential reports regarding production and shipments which the various makers return to the chamber every month. His figures on past performances may be regarded as authentic and his prophecy as reliable as any that can be obtained from any source.

The motor car production for 1916 will exceed	1,200,000	Registered in N. Y. State, Dec. 1, 1915	231,713
On the basis that any person with an income of \$1200 can own a car, there is a market for automobiles to the number of	5,000,000	Chauffeurs registered in New York State Dec. 1, 1915.....	79,899
Motor vehicles sold during 1915.....	892,618	Registered in California Oct. 1, 1915..	160,000
Retail value of cars and trucks sold in 1915	\$691,778,950	Registered in leading 10 grain states.	677,000
Passenger cars sold in 1915.....	842,249	Total manufacturers of passenger and commercial cars	448
Retail value of passenger cars sold in 1915	\$565,856,450	Commercial vehicle manufacturers....	257
Motor trucks sold in 1915.....	50,369	Dealers, garages, repair shops and supply stores	27,700
Retail value of motor trucks sold in 1915	\$125,922,500	States in which automobile factories are located	34
Number of carriages sold annually from 1908 to 1912.....	1,000,000	Proportion of motor vehicles to population of U. S.....	1 to 48
Miles of public road in the U. S.....	2,273,000	Proportion of motor vehicles to miles of road	1 to 1
Money spent in this country on highway construction last year, which made for tremendous increase in real estate values, almost.....	\$250,000,000	Proportion of automobiles to area of U. S.	1 to 11/3 sq. m.
Automobile exports to 80 different countries in 1915 increased 250% and will exceed	\$100,000,000	Scientific engineering, standardization of main parts, skilled manufacturing, big production and efficient selling brought the passenger car to an average price in 1915 of.....	\$672
In 1914 exports were.....	\$28,507,464	The average price of automobiles in 1899 for steam runabouts was.....	\$1,284
England is our best buyer of automobiles, taking for the year ending June 30, trucks, 5306; pleasure cars, 8321, valued at	\$21,000,000	The average price in 1907 went to....	\$2,123
Estimated value exports of commercial vehicles only, 1915 (increase 600%)..	\$63,000,000	The automobile and improved roads in some localities have increased land values	100% to 400%
Estimated value exports passenger cars during 1915 (increase 90%)....	\$37,000,000	Automobilists pay registration fees in all states and personal property tax, in addition, in all but four states. Many states also require and charge for a drivers' license, while others have a wheel tax. There was paid more than \$7 per car in motor vehicle fees for registration in 1915, exceeding	\$14,000,000
Freight carloads of automobiles shipped during 1915 exceeded.....	200,000	Keen competition in the automobile industry brought failures in the past five years of.....	400
Miles travelled annually by motor vehicles (5000 miles per car).....	12,000,000,000	Exports of cars and trucks per month are at the rate of.....	\$8,500,000
Gasoline consumed annually by automobiles (400 gallons per car) gallons..	980,000,000	Iowa leads per capita with one car for every 19 persons, with a total registration of cars of.....	117,407
Lubricating oil consumed annually (12 gallons per car) gallons.....	28,800,000	In 1899 the production was.....	3,700
Tires used annually on motor cars....	12,000,000	In 1903 the production was.....	11,000
Number of brands of tires used on motor cars, almost.....	125		
Number of types and sizes of tires...	140		
Motor vehicles registered in the U. S. from state reports July 1, 1915.....	2,070,000		
Total registrations for 1915.....	2,400,000		

SOCIAL EVENTS DURING SHOW WEEK.

HUNDREDS of banquets and dinners are to be given during New York show week by various automobile companies and accessory manufacturers to their salesmen, dealers and others with whom their business brings them into association. A large number of important meetings of trade organizations also are scheduled to take place. The more important events are:

Monday, Jan. 3—American Automobile Association—Executive committee meeting, Hotel Biltmore.

Tuesday, Jan. 4—National Automobile Chamber of Commerce—Annual banquet at Waldorf-Astoria, 7 p. m.

Wednesday, Jan. 5—National Automobile Chamber of Commerce—Directors' meeting at headquarters, 7 East 42nd street, 10 a. m.

Wednesday, Jan. 5—Meeting Motor and Accessory Manufacturers—Executive committee meeting at headquarters, 29 West 42nd street—morning.

Wednesday, Jan. 5—Motor and Accessory Manufacturers—Twelfth annual meeting at Waldorf-Astoria—afternoon.

Wednesday, Jan. 5—Motor and Accessory Manufacturers—Banquet at Waldorf-Astoria, 7:30 p. m.

Wednesday, Jan. 5, and Thursday, Jan. 6—Society of Automobile Engineers—Winter meeting and standards committee meeting.

Thursday, Jan. 6—Society of Automobile Engineers—Banquet at the Hotel Plaza, 7 p. m.

Friday, Jan. 7 and 9, 10, 11—National Association of Automobile Accessory Jobbers—meeting.

Special days at the show this year will be Pioneers' Day, Jan. 4, in honor of the first men in the industry; Society Day, Jan. 5, on which no double entrance fee, as in former years, will be charged; Military Day, Jan. 6, for which numerous military and navel men have been invited.

HEADQUARTERS AT BILTMORE.

The Mitchell-Lewis Motor Company has established headquarters for Mitchell dealers at the Hotel Biltmore, New York City, and will continue it during the New York show week. There will be an exhibit to supplement the Mitchell display at Grand Central Palace. The Mitchell company officials will make their headquarters there.

AMBASSADOR USES AN OVERLAND.

Brand Whitlock, United States ambassador to Belgium, after conferring with President Wilson

at Washington, travelled from there to Toledo in an Overland six-cylinder touring car. He chose this means of transportation in preference to railroad trains because he decided it would be more refreshing than by the other method. Mrs. Whitlock, her mother and a maid accompanied him. The trip required four days. Five snow storms were encountered and the roads were generally in bad condition. However, the distance was covered on 51 gallons of gasoline and 1½ gallons of oil. The car was in perfect condition upon arrival at Toledo.

DETROIT'S AUTOMOBILE SHOW.

Detroit's 15th annual automobile show, Jan. 15-22, will be housed in three connected buildings, the Palace auditorium, the Palais de Dance and the Pier. This arrangement is because of the fact that nowhere in the city could be found a single building large enough for the show. The three buildings afford about 60,000 square feet of floor space, which will be fully occupied by pleasure car, motor truck and accessory exhibits.

ADVERTISED PRICES IN CANADA.

Milton B. Kirk, United States consul at Orillia, Canada, urges that advertisements in American periodicals, newspapers and trade journals should include the price of the articles in Canada, as well as in the United States. He states that Canadians read those publications closely, and would buy American made goods more liberally if Canadian prices were shown. As a matter of sales psychology, he advises that when a Canadian goes to buy an article he has seen advertised in a magazine published in the United States, he is often deterred from buying when the shopkeeper quotes the higher Canadian price. On the other hand, if the prospective purchaser had seen the Canadian rate in the advertisement he would be prepared for the higher price and be willing to pay it.

Ralph de Palma is now working on new models in the experimental department of the Packard Motor Car Company. His special attention is directed to those turned out by J. G. Vincent, vice president.



THE most conspicuous innovation in the matter of motor vehicle design of the past year has been the development of eight and 12-cylinder engines. In the building of these cars American designers have for the first time broken away from the influence of European engineers and have taken a distinct step ahead.

It is true, of course, that the De Dion Bouton had built an eight-cylinder car for some time, and that the Sunbeam company had made a 12-cylinder racing car. But these were more or less experimental jobs, and up to the time the development began in America the European engineers had not made this type of car a commercial success and neither the makers or the public seemed alive to its possibilities.

The American response to the production has been overwhelmingly favorable. In a little more than a year not less than 20 eight-cylinder cars have been designed and offered to the public, and at least four 12s are now obtainable. Last year there were only two eight-cylinder cars at the New York show. They constituted .06 per cent. of all the models offered. This year the eights constitute 16 per cent. of all American models, while the 12's comprise 6.8 per cent.

Few radical departures from former practise have had such quick and widespread success. This is due in part, no doubt, to the high confidence in which the public held the companies that were among the first to take up the development, such as the Cadillac and the Cole concerns.

Shifting Engineering Controversy.

A year ago engineering controversy concerned the relative advantages of the eight and the six-cylinder car. This year that controversy has shifted to the relative advantages of the eight and the 12-cylinder types.

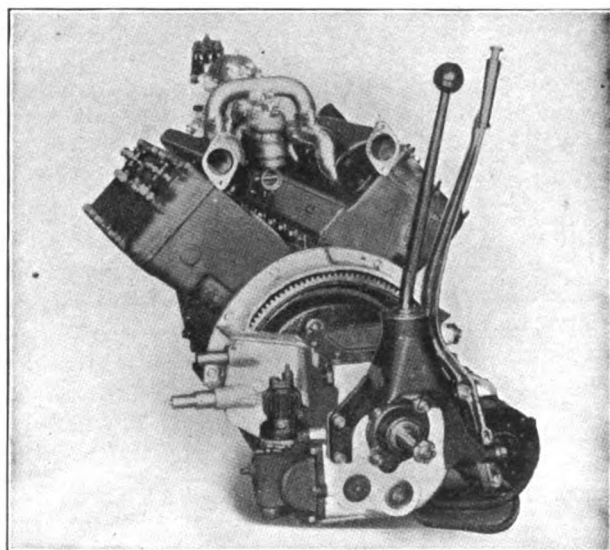
But as a matter of fact the eight and the 12 are really the same development in different phases. It is a development that has moreover

affected the four and the six, and it is quite likely that no matter how long the controversy endures all of the four types of engines now used will continue in practise—each for the purpose to which it is best adapted.

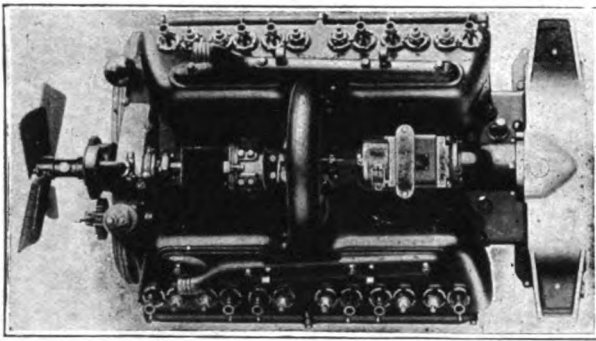
Both the eight and the 12 resulted from the development of the high speed, small bore, high efficiency engine. This type, whether it is made up in a four, a six or an eight, is preferred by the modern engineer, because it gives more power in a smaller unit, with lower weight and less complication. It is cheaper to manufacture than the heavy, slow motor of the type that has previously been used.

The development of this high speed, small bore engine taught most engineers that the most efficient size for cylinders was one with a bore of from 3 to 3½ inches and a stroke bore ratio of 1¼ to 1⅞. This size was found capable of developing the greatest volumetric efficiency.

Smaller cylinders were found to waste too



View of Cole Eight Motor from Rear.



Top View of an Eight-Cylinder Showing Starting Motor Between the Blocks.

much of their heat, and hence, of their power, because of its escaping through the sides of the cylinders and through radiation. Larger sizes operating at high speed developed such inertia forces that they caused excessive bearing wear, or were frequently broken.

Assuming that cylinders of this size are to be adopted, the number would then naturally be determined by the amount of power necessary for the car in which it is to be mounted. American users demand of a high class car that it shall have a range of speed of from two to 60 miles an hour and that it shall accelerate to 50 miles an hour, or thereabout, in 20 seconds.

Cylinders and Car Size.

By this reasoning for a heavy car, if the small bore, high-speed engine is to be used, at least eight cylinders would be required, and for an exceptionally large car 12 cylinders might be required. But other considerations enter into the calculation.

There is the matter of even torque. The chief reason for the abandonment of the four-cylinder in favor of the six was that it gave two additional power strokes per cycle, and, therefore, produced a much more even flow of power, which approach more nearly the ideal set by the steam turbine.

The six greatly reduced the torque vibration of the four, in which there were distinct pauses between the power strokes. It obviated, too, another sort of vibration. The pistons and other reciprocating weights in a four-cylinder engine are not in balance. At a given point in the power cycle a greater part of the weight is going downward than is going upward, or vice versa.

The result is that in a four-cylinder engine at high speeds marked vertical vibration is set up.

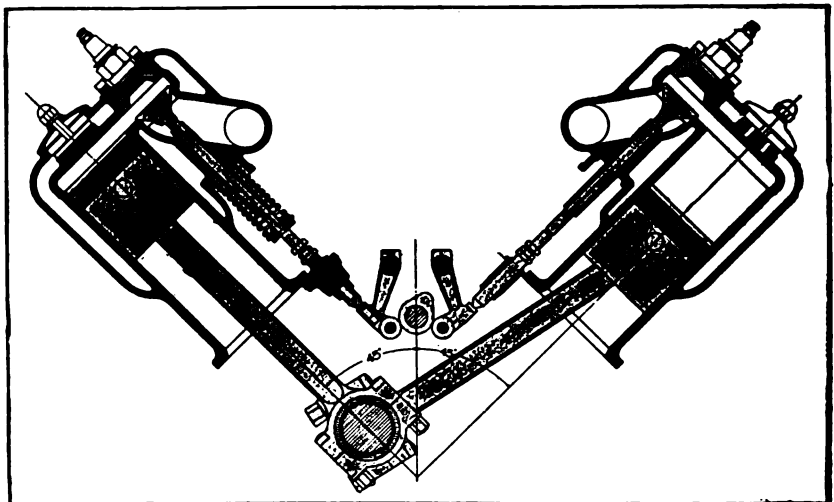
The six remedied this difficulty also. At any given time the weight of the pistons and other reciprocating parts that are going upward are exactly balanced by the weight of those that are going downward, and no vertical vibration can result.

Now the advantages claimed for the eight-cylinder as compared to a six-cylinder of the same power are that it still further improves the torque to the point where there is substantially no pause of any sort between the power strokes. There are four power impulses to every turn of the crankshaft, instead of three, as with the six. It greatly improves the six torque just as the six improved the four.

It makes a much shorter engine, and, therefore, allows a larger portion of the car to be used for the body. This is true because the V eight is only four cylinders long. Furthermore, the cylinders are smaller than they would be in a six of the same power. As the speed at which an engine runs increases it becomes important to cut down the weight of the pistons and other reciprocating parts, because every cut in their weight reduces the inertia forces. Naturally, the eight-cylinder having smaller sized cylinders has smaller pistons, and the bearing pressures are less.

Eight Cheaper to Build.

This shorter, more compact and lighter engine requires a much shorter crankshaft. Getting a good crankshaft has always been one of the greatest difficulties of motor building. In the six-cylinder is required a long piece of steel of great strength and great rigidity. If it is not



A Drawing of the Cadillac Eight Showing Valve Mechanism and the Location of the Camshaft.

rigid the shaft begins to whip during operation and sets up vibrations and causes a great deal of trouble.

The short crankshaft required for the eight can be made very stiff without much difficulty. This tends to cut down vibration. It also cuts expense. In general, eight-cylinder motors are lighter, more rigid, shorter and cheaper to build than six-cylinder motors of the same capacity. They have, in short, great manufacturing advantages in addition to their marked advantages in performance.

Those manufacturers who have adopted the 12-cylinder in place of the eight give as one of their reasons for their preference the fact that, like the four-cylinder, the eight has certain unbalanced inertia forces, which lead to vibration at high speeds.

Regarding the eight, they say the piston weights that are moving upward or downward at any given time do not balance. And as the cylinders are set at an angle this would result in a horizontal vibration at high speeds. The eight-cylinder advocates admit that theoretically this is true, but they declare that in a well designed eight-cylinder car no such vibration can be detected, because the crankshaft is made stiff enough to absorb such vibration, or because it can be counter weighted to produce a perfect balance, and because a vibration absorber is available to slow down and choke any vibration that may develop during operation.

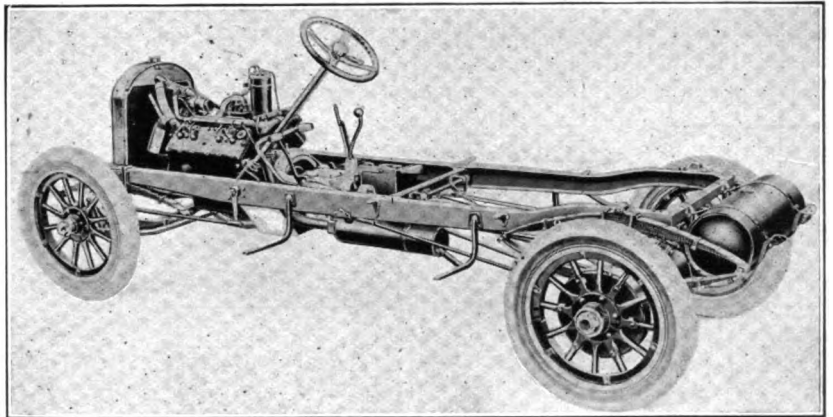
Another draw back to the eight, as the 12-cylinder advocates see it, is the width of the motor. In an eight-cylinder motor there are four strokes of each piston to each crankshaft revolution, or every 90 degrees. The result is that the cylinders must be set at an angle of 90 degrees from each other.

This makes a wide motor. It is not possible to narrow the front of the frame much to permit a short turning radius, as has been the case with most of the cars designed lately, which have all the cylinders in a single line. The engine is also so wide that most of the equipment, such as carburetor, starting and lighting system, and so on, must be mounted in the middle between the blocks, instead of being placed at the sides of the engine, as has been the general practise.

With the 12-cylinder, on the other hand, there

is a power stroke every 60 degrees, and the cylinders are set at a 60-degree angle. This makes a much narrower motor. It will fit into about the same width of frame that is required for a six-cylinder motor of similar power, and the accessories can be mounted in the usual fashion around the sides. This leaves the space between the blocks practically free, so that the valves may be easily reached. It also makes it easier to put in and take out the steering gear.

The twin-six motor is considered as a better manufacturing proposition, as it can be made at less cost than the single six of the same power. The engine is slightly longer than the eight, but it is narrower, which makes the weights almost equal. It is both shorter and lighter than the single six, because of the smaller size of the cylinders. It can be operated at much higher speed than the single six, because the smaller weight of the reciprocating parts does not create the high

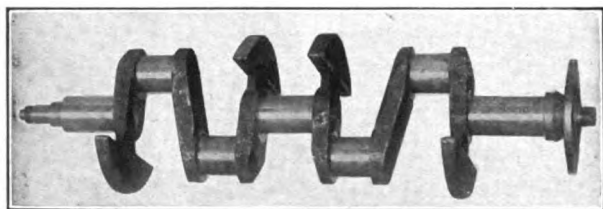


Chassis of the Jackson Eight.

inertia forces that would be created in larger cylinders.

The torque in a 12-cylinder is claimed by its adherents to be as much better than that of the eight, as the torque of the eight is better than that of the single six. The advocates of the eight are inclined to deny this. They say that the power impulses are so close together in the eight that greater frequency does not improve the behavior of the engine. They declare also that the impulses in the 12 greatly overlap and that the result of this overlapping is that two cylinders are drawing in gas at the same time. This forces the gas through the manifolds at great speed, causing much friction against the sides of the manifolds and preventing the perfectly equal distribution of gas among the cylinders that is attained in the eight-cylinder engine.

Future experience will have to settle this con-



Cole Crankshaft with Good View of Counterbalancing Weights.

troversty between the eight and the 12-cylinder designers. The points made by both sides are plausible and the final determination will result from the discovery of which are the most important. Many engineers now believe that whether eight or 12 cylinders are to be used is largely a matter of the size and weight of the car in which they are to be mounted. It is certain that remarkable performances have been secured with both types of construction.

In all types of the small bore, high speed, high efficiency engine, there has been a decided tendency to replace cast iron pistons with members made of aluminum. The great advantage of the last mentioned is their lighter weight. This type further tends to cut down the inertia forces caused by the movement of the pistons and to reduce bearing pressures. They also provide greater conductivity for heat and do not carbonize so readily as cast iron pistons.

The chief disadvantage is that they expand more under the effects of heat than do cast iron pistons and that makes it necessary to use a smaller piston with greater clearances between it and the cylinder wall when the engine is cold. The result is that the form of engine knock known as the piston slap is likely to develop in such engines when they are running cold. It disappears, however, when the components are thoroughly warmed up and the piston has expanded.

The various eight and 12-cylinder engines so far offered differ in some minor details. Some have the cylinders staggered slightly, so that the crank pins may be all in the same plane; some have overhead rocker valves, and some the usual type of poppet valves on the side. One eight-cylinder Knight engine, built by the F. B. Stearns Company, has been announced, but its details have not yet been made public.

Details of Cadillac Eight.

The Cadillac eight, which was the first American car of this type to be offered, has enjoyed a year of unparalleled success, and it is offered this year with substantially no changes in the mechanism. The starting and lighting units

have been remounted to make the valves accessible simply by removing the plates that protect them. The clutch and brake pedals have been made adjustable to fit the stature of the driver.

The cylinders are $3\frac{1}{8}$ by $5\frac{1}{8}$ and the piston displacement is 314 inches. The cranks are all in one plane and the crankshaft is of the same form as a four-cylinder motor. The crank case is divided horizontally and the cylinders are bolted to it. The crankshaft has three main bearings and is 26 inches long. One connecting rod has a yoked end and the other fits within the arms of the yoke, so that a single bearing can care for two rods.

There are only eight cams on the camshaft, which is directly above the crankshaft. Each cam operates two valves. The firing order alternates from one cylinder block to the other. A Cadillac carburetor is used in connection with a U-form manifold.

An original point in the Cadillac engine is the use of a thermostat in the cooling system. This operates in such a way that when the motor is cold the water is prevented from circulating into the radiator, so that only the water in the cylinder jackets needs to be warmed to increase the temperature of the motor. As soon as this exceeds the heat needed for effective operation the thermostatic valve opens to allow the water to flow out through the radiator and bring the whole cooling system into play. The valve is actuated by a copper tube containing a liquid that expands or contracts, according to the degree of heat.

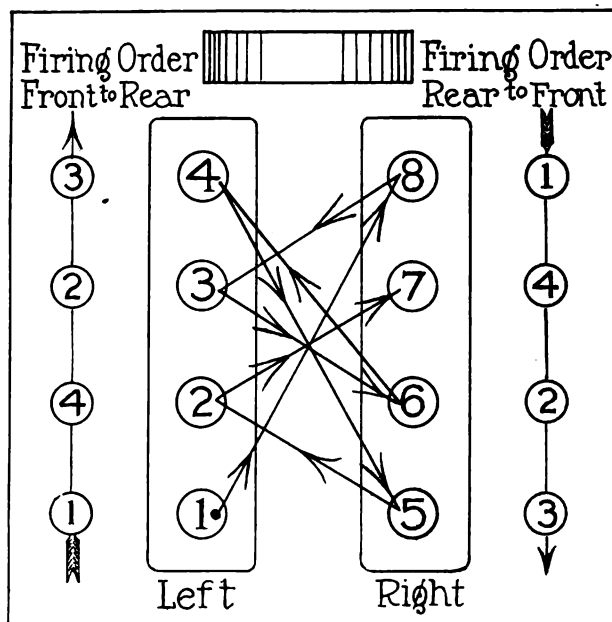
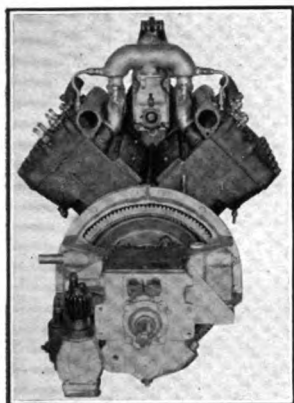


Diagram of the Firing Order in Cole Eight Motor.



**An Eight-Cylinder Motor
with Two Exhaust
Manifolds.**

high speeds and from this valve the oil goes through another pipe to a point above the camshaft, which is lubricated by gravity. The silent chains are lubricated from the same source.

The cylinder walls, pistons and wristpins are lubricated by splash from the ends of the connecting rods. There is an easily adjusted pressure gauge on the dash.

The Cole Eight Motor.

While the motor of the Cole eight does not differ from the Cadillac in essentials, many of the details are at variance. The cylinders are $3\frac{1}{2}$ -inch stroke by $4\frac{1}{2}$ -inch bore, and are cast in blocks with the jackets integral, which allows very ample space for water circulation. The cylinder heads are detachable.

The crank case is divided vertically instead of horizontally and the main bearings are carried in the right half of the crank case. The crankshaft is a three-bearing type, and varies in diameter. The centre bearing is $2\frac{1}{16}$ inches in diameter and three inches in length. The front and rear bearings are $2\frac{1}{8}$ inches in diameter. There are four crank pins, one each of which two connecting rods operate. One rod is forked and the other works inside the divisions of the fork.

The camshaft has 16 cams forged integral with it. It is located directly above the crankshaft. The valve mechanism is similar to that of the four-cylinder or six-cylinder L head engine.

Pressure lubrication is used. From the gear pump oil is forced to the main bearings under a pressure of 30

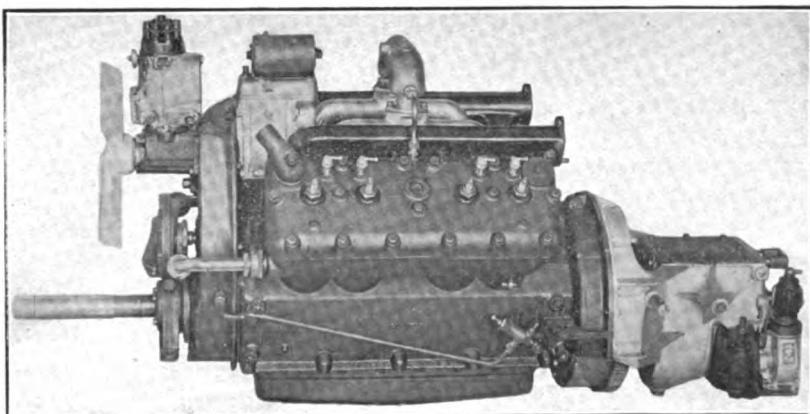
pounds. Holes in the crankshaft lead to the connecting rod bearings and from these the oil is distributed by centrifugal force in the form of spray to the camshaft bearings, valve mechanism and timing gear. There is a sight feed gauge on the dash. Water is circulated through the large capacity cooling system by a floating type pump. The fan is operated off the crankshaft by a silent chain. It is driven through a friction clutch, which permits the fan to revolve faster than the shaft if it is necessary to stop the car suddenly while going at high speed. Otherwise the inertia forces might ruin the fan blades. Fuel is supplied by a vacuum feed system to a Stromberg carburetor. Delco ignition, starting and lighting systems are used. *

A Smaller Eight Design.

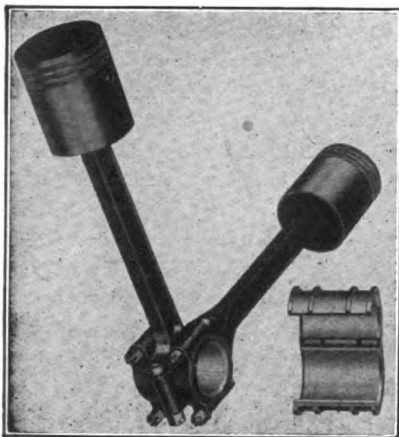
The Briscoe eight is a considerably smaller and lighter car than those previously described. The Ferro eight-cylinder motor, which has overhead valves, is used. The cylinders are three by $3\frac{1}{2}$, giving a piston displacement of only 198 inches. The upper half of the crank case is cast integral with the cylinders. There are 16 cams on the single camshaft. As in the other eights the cylinder timing is a duplicate of the usual four-cylinder system, No. 1 cylinder on the right being followed by No. 1 cylinder on the left, and so on.

Cylinder heads are detachable, and they carry the valve mechanism, the water outlet connections and all components at the top part of the cylinders, with the exception of the spark plugs. A combined water outlet and fuel intake is an unusual feature. It is designed to preheat the gas before it reaches the cylinders. Thermo-syphon cooling is employed. The forked system of attaching the connecting rods to the crankshaft is used.

The Olds eight is also a small engine and has



An Eight with Unusual Mounting of Distributor.



Cadillac Connecting Rods Showing Forked Rod Arrangement.

cylinders $2\frac{7}{8}$ by $4\frac{3}{4}$. Each cylinder group is integral with half the crank case, which is divided vertically. There is a pan in a bottom opening of the crank case, which functions as the oil reservoir.

The motor has an exceptionally heavy crankshaft, which is supported on two instead of three main bearings. The forked connecting rod system is employed.

If the camshaft is carried sufficiently high above the crankshaft to place the valves at a sharper horizontal angle than the cylinders—at about 135 degrees a single camshaft may be made to operate valves on either side—and this design is used in the Olds eight. The camshaft is driven by gears from the crankshaft and there is a silent drive chain to the generator, fan and distributor shaft, which is directly above. All these gears are neatly enclosed by a stamping.

The ignition distributor, which is entirely separate from the generator, is mounted on the fan support. A three-unit Delcô starting and lighting system is disposed in such a way that accessibility in the spaces between the cylinder blocks is not destroyed.

A force feed pump lubricates the two main bearings under pressure. A check valve opens when a certain pressure is exceeded, and the surplus then passes to the camshaft and front gears and chain. Through the drillings in the crankshaft the connecting rod lower ends are lubricated and the surplus is thrown into the cylinders to lubricate the pistons and wrist pin bearings.

The Regal Eight-Cylinder.

The Port Huron eight-cylinder engine, used on the Regal model, has three by $4\frac{1}{2}$ cylinders. The valves are more inclined than the cylinders themselves and a single camshaft is employed. In the lubrication system a separate plunger pump is used for each block of cylinders. These force oil to the main bearings under pressure. The crankshaft is drilled to the pin bearings and there are splashers to lubricate the cylinders.

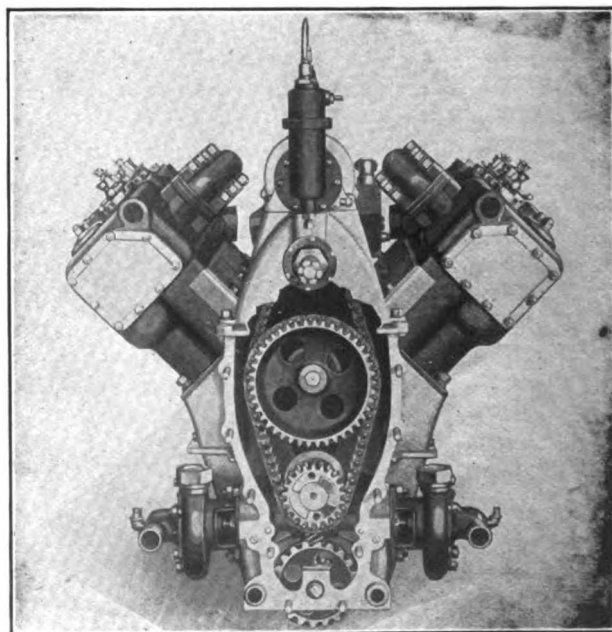
These examples will indicate how alike are

the various eight-cylinder designs and the chief details in which they differ. Turning now to the 12-cylinder V engines, they are found to be very similar in general principles with minor differences similar in character to those noted in the eights.

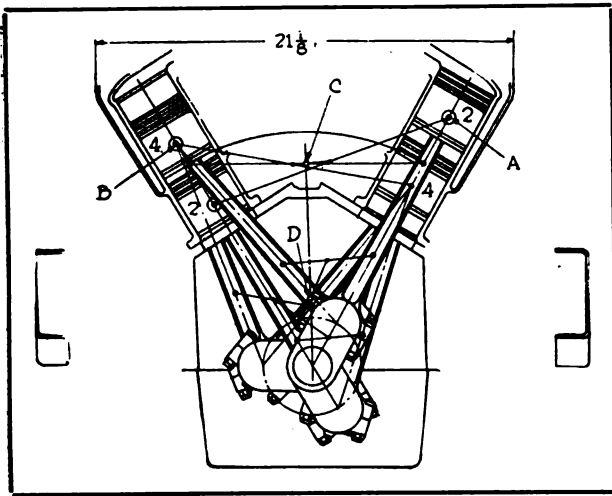
The cylinders are set at an angle of 60 instead of 90 degrees. In the Packard 12 they have a three-inch bore by five-inch stroke, giving a displacement of 424 cubic inches. Exceptional attention has been devoted to cutting down the weight of the reciprocating parts. An aluminum alloy is used for the pistons and the connecting rods are machined all over. Cylinders are of the ordinary L head type, and valves are located between the cylinder blocks. The starting motor and other accessories are mounted along the outside of the engine, as in the ordinary four or six design. This construction clears the valves of obstructions.

Some Packard Features.

Pressure feed oiling is employed, with pipes to the main bearings and the drilled crankshaft to the rod ends. Tubes attached to the connecting rods lead to the wristpin bearings. Spray from the wristpins, as well as spray from the cranks, oils the cylinders. Mist rising from the crank case through drilled holes lubricates the valve mechanism, and direct feeds supply the generator shaft bearing, the air and oil pumps, and the timer drive shafts. The pump is a herring bone design and is equipped with a regulator to govern oil pressure.



An End View of the Cadillac Motor.



A Drawing of the Cole Motor Showing Relative Positions of the Pistons.

Roller type tappets are used, and there are 24 cams integral with the single camshaft, which is driven by silent chain. The ignition timer is operated by worm gearing from the crankshaft.

Three main bearings carry the crankshaft. The crank case is in two sections and the lower half can be taken off without dismantling the bearings. The cooling system is regulated by a thermostat in the manner described in the reference to the Cadillac eight.

The carburetor, which is a Packard design, is mounted close to the exhaust pipes so that the gas is preheated. The fuel goes into the cylinders by short and direct water jacketed manifolds, and is distributed to the different cylinders through water jacketed manifolds that are integral with the cylinders. The starting motor is a special Packard-Bijur design, and is entirely separate from the generator, which charges the 120 ampere-hour storage battery. A reserve battery is located in a water tight box on the left side member of the frame. There is a circuit breaker and distributor for each set of cylinders.

The important points of difference in the National 12 are that in this design the valves are on the outside of the cylinders, so that their position is the same as in a four or six, and they are equally accessible. It is also the first car of more than six cylinders to employ high-tension magneto, instead of battery generator ignition.

Cylinders of $2\frac{3}{4}$ bore by $4\frac{3}{4}$ stroke and light alumi-

num alloy pistons are employed. The cylinders are cast in blocks of six. The carburetor is set between the cylinder blocks and gas is fed to the cylinders through a short intake manifold leading in each direction. Water manifolds on top of each set of cylinders lead to the radiator. The oiling is by pressure throughout, with feed to main bearings through a hollow crankshaft and drilled leads to all other parts of the engine.

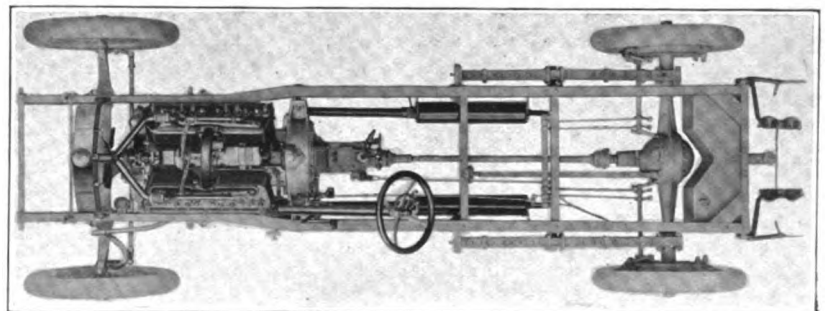
Exhaust pipes are on the outside of each set of cylinders and each is fitted with a separate muffler. The water pump is of the double type arranged to pump oil evenly to both sets of cylinders. The starting and lighting equipment is of Westinghouse design and construction.

The Enger twin-six, a 12-cylinder car, which sells for \$1095, has cylinders of $2\frac{3}{8}$ inches by $3\frac{1}{2}$ -inch stroke, and cast in blocks of six. Cylinder heads are removable, which is a unique 12-cylinder feature. Easy adjustment of the tappets is possible.

Each valve is operated by an independent cam. Both the camshaft and the generator shaft are driven by silent chains. There is only one camshaft. A force feed system of lubrication is employed, as in other 12-cylinder, engine designs, and the oil passes through the hollow crankshaft. Ignition timer drive is direct from the camshaft. The single carburetor is of the double entrance type. There is a hot water jacket of large proportions around the manifold.

THE VANDERBILT CUP.

It is reported that the Vanderbilt cup, which for many years has been an automobile racing trophy, is to be contested for in eastern speedway events. It is understood that W. K. Vanderbilt, the donor, will offer it at the next Sheepshead Bay race, May 13, which will probably become known as the Vanderbilt Cup in contradistinction to the Astor Cup in the late fall.



A Bird's Eye View of the National 12 Chassis.

S. A. E. TO DISCUSS IGNITION.

THE chief subject regarding design to be touched upon by the S. A. E. at its winter meeting during the New York show will be the comparative advantages of magneto and battery generator ignition.

There has been an increasing tendency of late, even among the higher priced car makers, to adopt battery and distributor ignition, and this has been especially noticeable in the multi-cylinder engines. In consequence thereof both systems have been put to exhaustive comparative tests by many engineering departments. The results of these tests will be given to the engineers at the mid-winter meeting for the first time.

Supporters of both forms of ignition are certain to be present. Modern battery ignition, while similar in principle to the battery ignition that was used before the magneto was developed, has been improved to the point where it is very different in efficiency and convenience.

The points that will probably be made for battery generator ignition are that as the storage battery is automatically charged by the generator, a constant source of electricity is at hand, which is equally as good as the magneto. With such a system already in use the magneto is pure duplication. It is unusual to use the magneto for starting inasmuch as the battery is usually depended upon. That the hot spark theory on which magneto ignition has been defended has been proved by scientific investigation to be untenable, will be claimed.

The magneto men, on the other hand, will say that after having abandoned battery ignition once the makers are going in a circle when they come back to it; that batteries frequently get out of order because they are not properly cared for by owners, which makes them poor sources at times for ignition current. They also hold that starting current drawn exclusively from batteries must be taken from them at a time when the starting motor is also absorbing a large amount of energy from that source, which reduces the effectiveness of the spark.

RITTMAN EXPLAINS HIGH GAS PRICES.

Dr. Walter F. Rittman, who some time ago perfected a process by which triple the usual amount of gasoline may be extracted from crude oil, talked recently to the Detroit Board of Commerce on the present gasoline situation.

He said the rapid rise in price was due to the fact that the export of gasoline now comes to 250,000,000 gallons a year, and that the Cushing oil fields of Oklahoma are gradually being exhausted. A year ago they were producing 300,000 barrels of crude oil a day.

In Boston there has been a 60 per cent. rise in the price of gasoline since the first of January, 1915. A new wholesale price of fuel at 21 cents a gallon, which will make the retail price 25 or 26 cents, has been announced by all the companies. A year ago the wholesale price was 13 cents.

SAN DIEGO EXPOSITION TO CONTINUE.

It is likely that the exposition at San Diego, Cal., will be continued for another year, which affords an interesting objective for trans-continental travellers over the Lincoln and other highways. The Lincoln highway has been improved a great deal during the past year and has received much valuable advertising from those who have made the trip and have returned enthusiastic over the exceptional interest provided. Travel over it next year is expected to be greater than it was in 1915.

The Lincoln highway committee of the American Institute of Architects is preparing designs for the marking of the Lincoln highway through New York City from the Forty-second street ferry on the Hudson river to Fifth avenue.

At the recent meeting of the finance committee of the General Motors Company action was taken to give the Lincoln highway propaganda liberal support during the next three years. The company thus becomes one of the founders of the association.

The last stretch of unpaved road on the way from Detroit to Pontiac, Mich., is to be paved with the same concrete surface that covers the rest of the way. The paving is expected to be complete by July 1, 1916.

This road, between two of the chief Michigan motor manufacturing cities, lies in a district that has been attractive to many of Detroit's wealthy men as locations for their summer homes. The completion of the road is expected to greatly accelerate the movement, with the result that the country may soon be well settled.



SEVERAL new models, the product of well known car manufacturers, will be placed before the public for the first time at the New York show. For those who follow automobile progress closely these will be of greater interest than the cars that have been on the market for several months.

The Cole Motor Car Company will display a new eight-cylinder model, priced at \$1595, which is larger and better than the eight the company sold last year. It is the only model that the company will make this year. Three inches has been added to the length of the wheelbase, making it 127 inches, and the body has been increased in size correspondingly. A double cowl body, with divided front seats, is used. The crankshaft is counterbalanced and aluminum pistons are employed. Auxiliary seats disappear when not in use, and the rear seat has been made wider. Two inches have been added to width of the frame side members. Longer semi-elliptic springs are used, and the rear springs pass under the axle, which tends to reducing the centre of gravity. The Cole motor is described in the article on multi-cylinder engines.

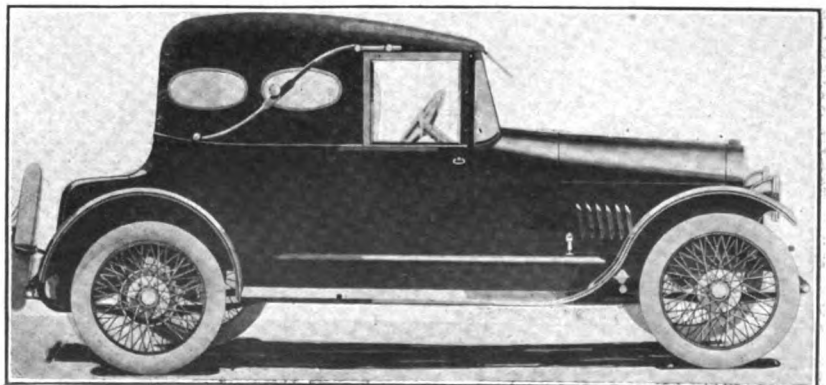
Oakland will show a new eight, to sell at \$1585. This has a high speed engine with counterbalanced crankshaft and aluminum pistons. An original feature is an aluminum draft inducer, which resembles a small steamboat funnel and provides plenty of air to the carburetor. Cylinder heads are detachable.

Two new Winton sixes will be on display, model 33 at \$2285, and the 48 at \$3500. These

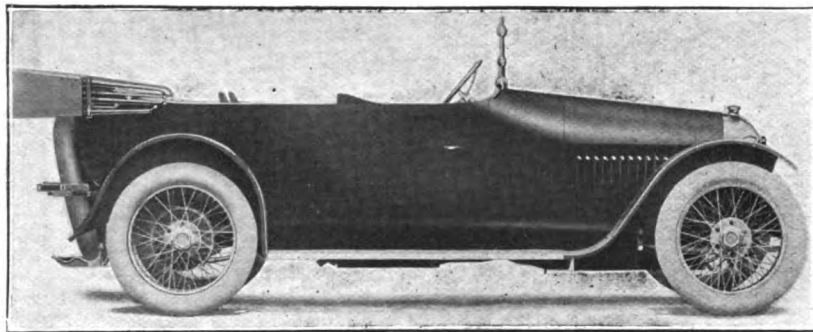
models show no radical departures from Winton practise of the past, though many details have been improved. Among the changes are the use of Dann spring inserts, underslung rear springs, Bosch ignition, Bijur lighting and starting system and two sets of lamps in the headlights. Great attention and individual treatment has been given to the bodies.

A seven-passenger touring car and a four-passenger roadster replace the Chandler models of last year. There are no important mechanical changes. Wheelbase has been increased from 122 to 123 inches. Some of the features are aluminum crank case, full floating worm bevel axle and long semi-elliptic springs at the front and the rear. Seat cushions are deep and soft, and are tilted toward the rear. Long grain English leather is used as covering material. The body is finished in Chandler blue and is designed in the now familiar double cowl type, with an aisleway between the front seats.

The Auburn Automobile Company will show three models, of which one, the 6-38, is entirely



Abbott-Detroit "6-44" Motor Coach.



Pathfinder 12 Touring Car.

new. It is similar, however, to the others in design, simply providing another size of Auburn car. Among the more noticeable improvements are the adoption of cantilever springs, vacuum gas feed with tank at the rear, flush U doors, invisible hinges, a larger driver's compartment and more space in the tonneau.

The Consolidated Car Company, makers of Abbott-Detroit cars, offers a new six-cylinder touring car for \$1195. It has a Continental six-cylinder motor, with a detachable head. The lower half of the crank case and the flywheel and clutch housing can be taken off without disturbing other parts to get at the motor or the clutch. Remy ignition, with every wire in a metal conduit, has been adopted. Each wire is in a different color. The distributor and coil are mounted integral with the generator.

The drive is taken through the rear springs to the frame, the rear half of the springs acting as draw bars. The wheelbase is 122 inches. The chassis is said to have 84 less parts than previous Abbott-Detroit productions.

The body of the touring car is finished in black, with cream colored wheels. Tires are 32 by four inches and the car's equipment is complete. A four-passenger closed coach sells for \$1495. The finish is black, with white enamelled wire wheels. Bright finish long grain leather is used for upholstery. Headlights are of the double bulb type. There is a dome light and a dash and a trouble light. Tires are 33 inches by $4\frac{1}{2}$ inches. A four-passenger coupe type roadster is offered on the same chassis for \$1250. There is a five-passenger touring sedan for \$1795, and a two-passenger speedster for \$1195.

The Pathfinder 12.

The Pathfinder 12 will create much interest. The two sets of six cylinders are placed at the

usual angle of 60 degrees, but they are unusual in that one block is placed $1\frac{1}{4}$ inches ahead of the other. The object of this arrangement is to bring the connecting rods to the crankshaft along side each other, which design is to avoid the forked rod arrangement used in many V type engines.

There is no accessory in the alley between the cylinder blocks except the carburetor, the electrical units being mounted along the outside of the motor. Removable cylinder heads are employed so that the interior of the engine is easily accessible. Overhead valves are used and they are assembled entirely in the removable cylinder head.

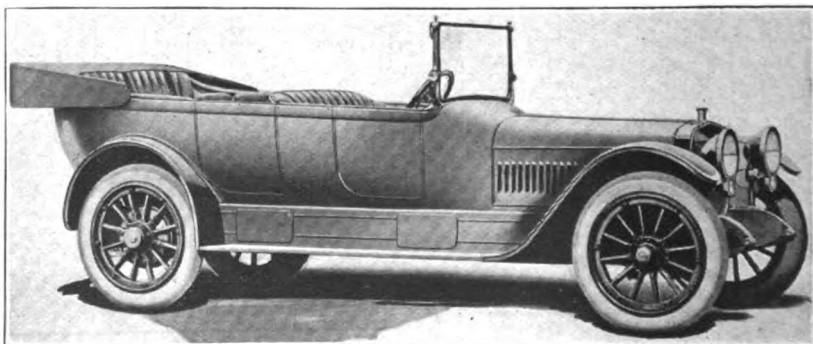
Wire wheels are standard on all the Pathfinder 12-cylinder models. The body design is an unusual type of streamline without the double cowl. It has only a very slight projection of the back of the front seat above the parapet.

The Paige-Detroit "Hollywood Six," which sold last year for \$1095, is to be replaced this year by the "Fleetwood Six," at \$1050. It will be displayed at the New York show. It is known as the "Six-38" and, in a smaller size, it reproduces all of the features which made the "Six-46" Fairfield an extremely popular car last year.

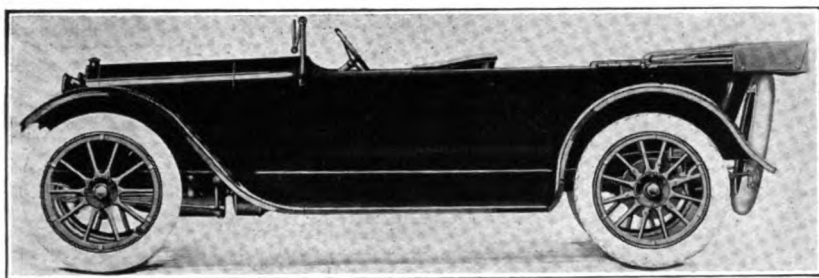
It has the European type of streamline body, full "U" shaped doors, the same axle design, clutch, transmission, unit power plant, three-point suspension and control arrangements, radiator, timing gear, oiling system and distributor drive.

The front compartment of the body is exceptionally roomy and will comfortably hold three adult passengers. Remy high-tension distributor, with a Willard six-volt battery and a Gray & Davis starting and lighting system, are used.

The cylinders are block cast, $3\frac{1}{8}$ by five, with



New Winton Six Model.



Elcar Touring Type, Streamline Body.

a separate cylinder head. Valves are on the right side. The crankshaft has three main bearings. There are three speeds and reverse in the transmission, multiple disc clutch, forced lubrication to main bearings and helical timing gears and splash to the rest of the motor. Gasoline is fed by gravity from a tank under the dash. Both chassis, with a number of body types, are displayed at the show.

New Westcott Model.

The Westcott Motor Car Company, Richmond, Ind., is offering a new five-passenger car, known as the model 42. It has a Continental six-cylinder motor, with $3\frac{1}{2}$ -inch bore by $5\frac{1}{4}$ -inch stroke. The car is offered with sedan and cabriolet bodies, which are detachable and are fitted in such a way that the connection between the two is practically invisible.

The roadster model, as well as the cabriolet, has the clover leaf arrangement of seats. A six-inch adjustment is provided for both clutch and brake pedals. The entire base of the motor is aluminum, only the cylinders being of cast iron. Lubrication is forced to main bearings, and other bearings are lubricated by splash.

The touring car and roadster of this new model are priced at \$1445, and the cabriolet at \$1745.

Both the National Highway Six and Highway 12 are new models this year, and both will be exhibited at the show. The Highway 12 is the car on which most emphasis is being placed for the coming year. It sells for \$1990, although the National company during its 16 years of existence has not previously marketed a car at less than \$2000. The design of the National 12-cylinder is discussed in this issue in the article on multi-cylinder motors.

The new series of four-cylinder Mercer models, known as the 22-72, is very similar to pre-

vious Mercer productions, which have always been four-cylinders. However, much refinement has been accomplished, chiefly in the direction of making the cars lighter in weight. The motors are $3\frac{3}{4}$ by $6\frac{3}{4}$ inches.

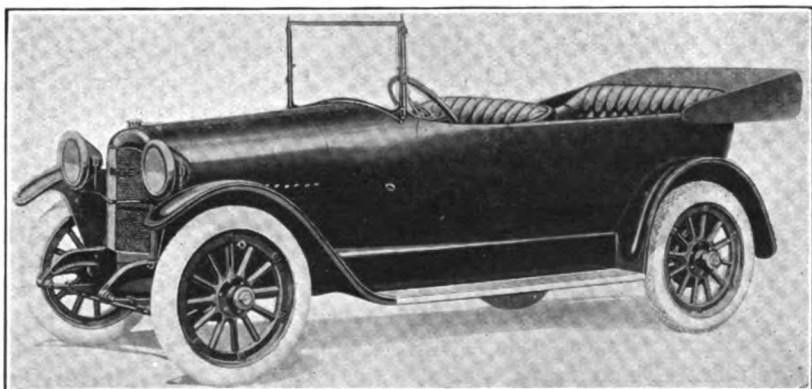
Aluminum pistons are used. The weight of the connecting rods has been reduced to three pounds five ounces. The motor is very clean in appearance. The only outside attachment is a Zenith carburetor. The intake manifold is integral with the cylinder block, and the crank case has a web which extends to the frame side, doing away with the necessity for an oil pan.

SJR New Light Car.

A new light car of European appearance, which will be shown in New York, and should appeal strongly, is the SJR boulevard roadster.

Some of the mechanical features are block cast cylinders, $3\frac{1}{4}$ by five inches, with water cooled removable heads and two-bearing crankshaft. Ignition is by high-tension magneto. There is a disc clutch and a three-speed sliding gear set. The radiator is of European design and has large water capacity. A single unit six-volt starting and lighting generator is employed. Gasoline is fed from a tank under the dash by gravity. There is a handsome highly polished instrument board and a rain vision ventilating windshield, with French plate glass. Wheelbase is 108 inches and tread 56 inches. Ball bearings are used throughout. The body is a speedy looking type of pressed steel. Its lines give the car unusual distinction. The equipment is complete and the price is \$855.

The new eight-cylinder Olds product, which will be seen at the show, has cylinders $2\frac{7}{8}$ by $4\frac{3}{4}$. The motor develops 40 horsepower. The crank case is divided vertically and the halves are cast

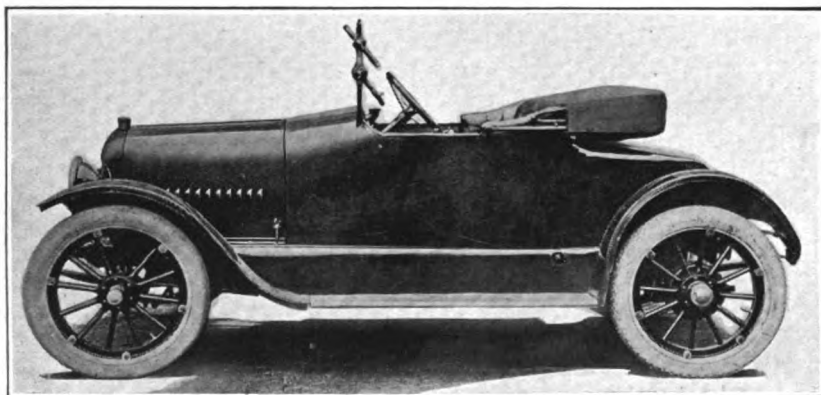


Paige Fleetwood "6-38."

integral with the cylinders. Cylinder heads are cast in blocks of four; they carry the priming cocks and spark plugs and are removable, giving quick access to the valves and pistons. A single drop forged camshaft and aluminum die cast pistons are used. Starting is by a single-unit Delco system.

Advanced Chicago Product.

Three models of new cars are produced by the Farmack Motor Corporation, Chicago, all of which are mounted on one chassis. The motor is a four-cylinder overhead valve type with overhead camshaft. Wheelbase is 112 inches. Lubrication is by the constant splash type with oil circulating plunger pump. Cooling is thermo-siphon with tubular and fin type radiator. Cone clutch and three-speed sliding gear case are employed. The touring car weighs 2300 pounds and the roadster 2250 pounds. These cars will be shown at the Chicago show.



New Farmack Roadster from Chicago.

The Sterling Automobile Manufacturing Company, New York City, is offering a four-cylinder, fully equipped roadster model at \$550. The motor is three inches by $4\frac{1}{4}$ inches. Lubrication is by a self-contained plunger pump splash with an individual oil pocket for each connecting rod. Zenith carburetor, leather faced cone clutch, 102-inch wheelbase, Auto-Lite starting and lighting system with Bendix drive and Unisparker ignition are other features.

Elcar is the name of the new production of the Elkhart Carriage and Motor Car Company. The price is \$775. The motor is a high-speed, high efficiency type, with $3\frac{1}{2}$ -inch bore by five-inch stroke. Removable cylinder heads, combination splash and pump lubrication, thermo-siphon cooling, three-speed transmission, unit power plant, Delco ignition and starting and lighting are outstanding features. The car will be shown at Chicago.

DETROITER PROVES EFFICIENT.

C. L. Lamb, Palm City, Fla., has written to the Detroit Motor Car Company, Detroit, that he made a trip from the factory to his home, a distance of approximately 1780 miles, in a Detroit car and did not during the journey have to use a wrench, or other tool, on the machine. He carried five passengers beside himself and about 600 pounds of personal baggage and camping equipment. The route led through the Tennessee mountains and the sand stretches of Florida.

GOODRICH TO PROTECT DEALERS.

The B. F. Goodrich Company, Akron, O., has notified its dealers that due to the tire cost uncertainty that may prevail from some time to come it will protect them from loss. Should prices advance and then decline the company will offer protection for a period of four months previous to such decline.

The protection will be in the form of rebate credit to equal the difference between the purchase price and the new and lower price on all Goodrich goods purchased during the protection period and still on hand unsold at the time of the reduction. This policy goes into effect Jan. 1, 1916. The price protection plan described will, however, date back to any period of purchase that represents the time allowed, whether the purchase date is after or before Jan. 1, 1916.

RICH MEN BUY MEDIUM-PRICED CARS.

The increasing tendency of men of wealth to buy in the medium priced class is illustrated by two sales of Overland cars, made recently on the same day, one in Washington and one in Omaha.

Congressman Champ Clark bought an Overland 83, replacing a much higher priced car. A. L. Mohler, president of the Union Pacific railway, who already owns two cars of the highest price, also bought an Overland.

A few years ago men of their standing were considered prospects exclusively for the highest priced cars. However, the great improvement, mechanically and otherwise, of the moderate priced car, has made many of them prospects for that type of vehicle.

NEW SEVEN-PASSENGER KING EIGHT.

Model E Has a Larger Motor and Longer Chassis and Sells for \$1350—Five-Passenger Eight, Known as Model D, Is Priced at \$1150.

THE King Motor Car Company, which several weeks ago announced a reduction in price of its model D, five-passenger, eight-cylinder car to \$1150, now announces a seven-passenger, eight-cylinder model with larger motor and larger chassis to sell for \$1350.

The seven-passenger chassis has a motor of three-inch bore by five-inch stroke, as compared to 2 $\frac{7}{8}$ by five-inch of the five-passenger model. The new car's wheelbase measures 120 inches, it has 34 by four-inch tires and a number of other changes and refinements in the mechanism have been worked out.

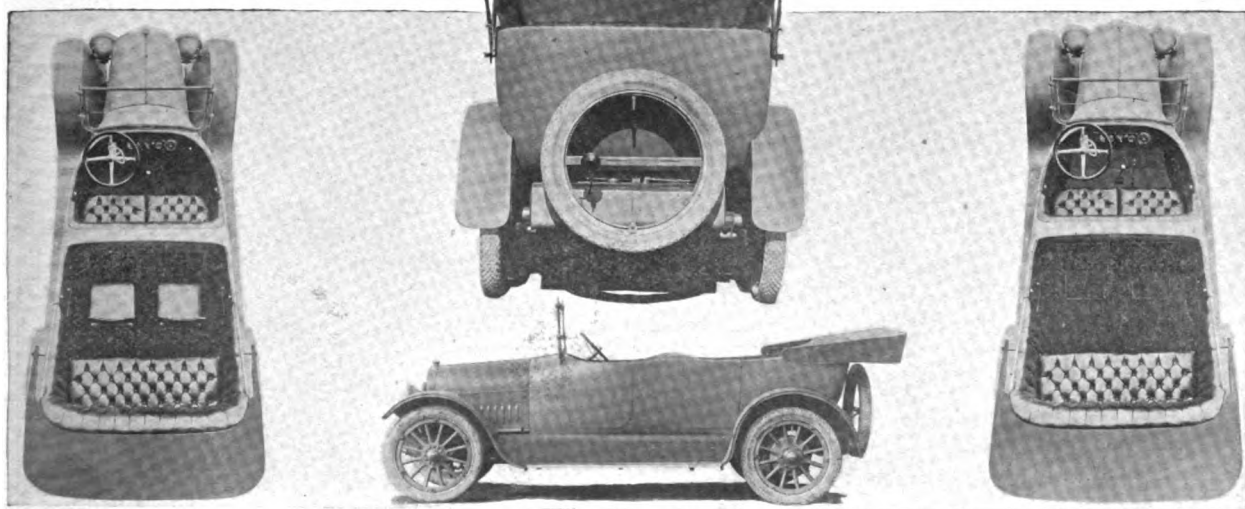
The new chassis will be known as model E, and will be equipped as a touring car, a five-passenger roadster and as a sedan. The smaller car, model D, will be built in roadster and touring car types.

During the summer the King company announced that it would not change its models in the mid-summer season, but would make announcements in the late fall, at about the time of the New York show. This policy was adopted so that dealers could order their cars during the winter with the assurance that announcement of a new model would not interrupt their sales at the height of the season in June.

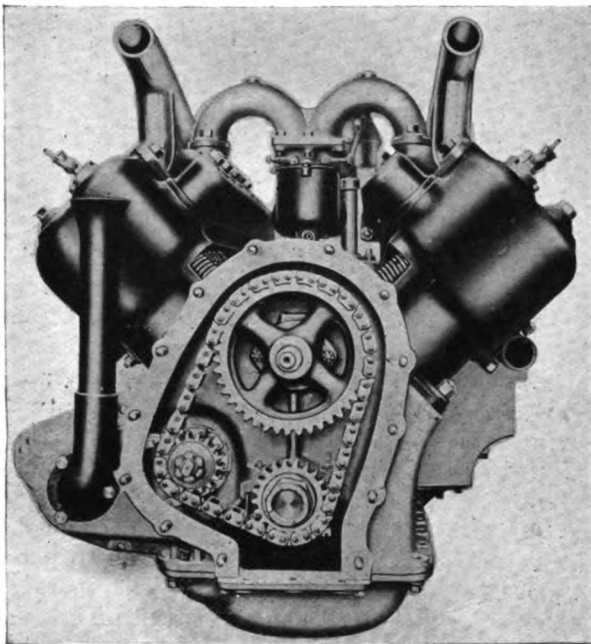
The body of the new car is of the most modern design. It has graceful boat lines, which gradually spread outward and upward, from the radiator to the full rounded back, which gives an impression of exceptional comfort. Crowned fenders and body skirt are also applied. The two auxiliary seats in the touring car fold into the back of the front seats, while in the roadster they fold into the rear deck.

There are some new features in the design of the motor. The cylinders are staggered to permit the use of connecting rods, which operate side by side on the crankshaft instead of in the yoke. The cylinders are set at an angle of 90 degrees and are cast in blocks of four. Aluminum pistons are employed to cut down inertia forces, to insure smooth operation of the motor and to resist carbonization. The aluminum crank case and clutch housing are cast in one piece.

The components of the motor are very accessible, and to aid in this particular the King engineers have placed the ignition distributor at the rear of the engine and just in front of the cowl. The radiator has exceptionally large capacity and there is an extension tank to hold an additional water supply and large intake and outlet water manifolds to make circulation easy. The



In the King Model E Auxiliary Seats Fold Into the Rear Deck of the Front Seat, as Shown Above—The Unusual Width of the Body Is Indicated by the View of the Rear, While Double Cowl Body Is Shown in the Side View.



Front View of the King Motor, Showing Silent Chain Connections—Oil Pump Operated from Idler and Mounting of Carburetor.

exhaust manifold is unusually large. The designers took care to provide ample bearing surfaces for both the main and the connecting rod bearings.

The unit type of power plant and three-point suspension is employed. Lubrication is a combination of forced feed and splash. Ignition is furnished by Willard storage battery and Atwater-Kent distributing system. For starting and lighting a Ward-Leonard single unit system is employed. The Ball duplex carburetor, in the $1\frac{1}{4}$ -inch model, is used, and fuel is fed by the Stewart vacuum system.

The starting motor is mounted above the crank case, and is connected with the flywheel and extends back over the clutch housing. The transmission case is very compact and is very firmly bolted to the crank case. The emergency brake is placed on the rear of the transmission case and is operated on the shaft. The rocker shafts have been eliminated from the rear axle.

The clutch and service brake pedals are adjustable. A double universal joint is used between

the propeller shaft and the differential.

The King company was the first in this country to introduce the cantilever type of spring suspension. On this new chassis the engineers have modified the usual method of application somewhat.

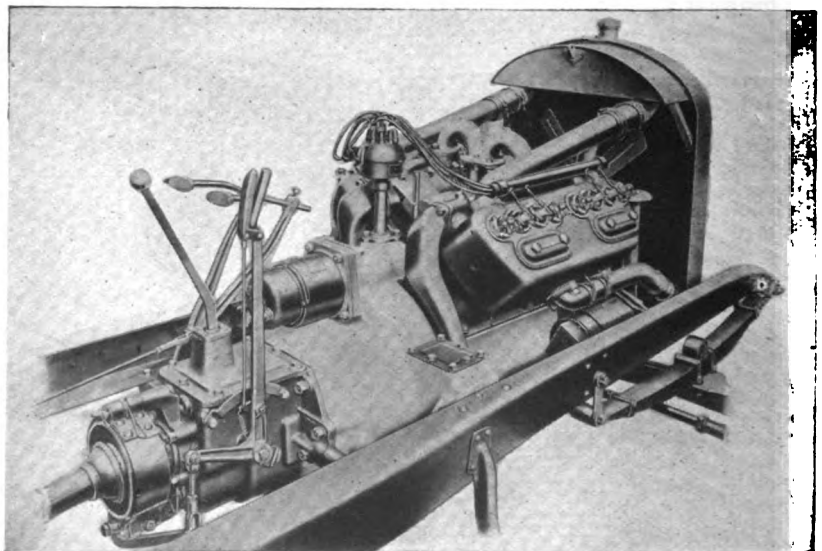
The forward end of the spring is now attached to the frame by means of a shackle, while the rear end is underslung from the rear axle. The whole spring suspension is placed lower on the frame, which gives the car a much "lower seat" without losing road clearance.

The connection between the rear axle and the rear cross member of the chassis is made by means of a yoke torsion rod and a swivel joint connection, which affords full action of the springs. A deeper and wider channel section and heavy cross members give the chassis unusual sturdiness. The front cross member is so shaped as to support the front leg of the motor, while at the same time it cradles the radiator.

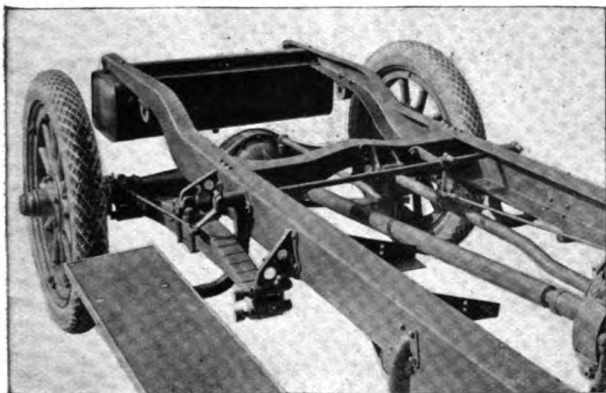
The equipment includes a special one-man top, quick attachable curtains, a motor driven tire pump, electric horn, extra rim and a full set of tools.

The five-passenger car, model D, which will sell for \$1150, is a somewhat refined version of the original King eight, announced on Oct. 24, 1914. It was sold during the past season for \$1350, and a very large volume of sales were made. In fact, the company claims to have in operation the second largest number of eight-cylinder cars of any American maker.

In the refined five-passenger eight the motor



King Motor of Model E, Showing Staggered Cylinders, and Mounting of the Starting Motor Over the Gearset.



Rear View of King Chassis, Showing Method of Rear Spring Suspension and Service Brake Attachment.

has larger dimensions and more power. A larger carburetor is used, and there are refinements in the lubrication, radiation and ignition systems which are results of a year's experience with the eight-cylinder design under all kinds of conditions.

New Colors Are Adapted.

The color scheme has been changed from a blue to a salon green body and hood, with black fenders, running gear and wheels. A fine gold stripe is used as a touch of distinctiveness. The apron that was formerly used on the back of the front seats has been removed. A one-piece, top back is employed as standard for the tops of the new model. The leather upholstery has been changed from bright to dull finish.

Recently the company announced an addition of 70,000 square feet to its manufacturing space and this, in connection with the fact that it bought a great deal of material some time ago when prices were lower, make possible the pro-

duction of an improved eight-cylinder car at a comparatively low price.

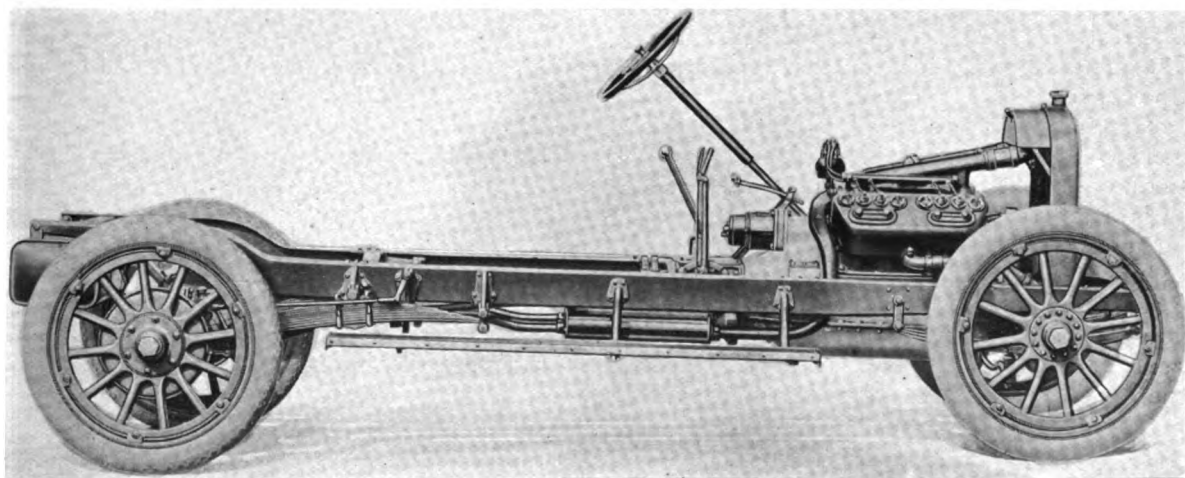
The volume of business in eight-cylinder cars built up by the King Motor Car Company during the past year has been sufficient to give the company excellent ground floor positions at the New York and Chicago shows. The company was fortunate in being able to put its models on the market ahead of the many eight-cylinder cars that have been announced during the past few months. Its cars have sold readily and the company has been able to cut down its overhead and to produce cars at comparatively small cost.

WOMEN DRIVE TRUCKS IN ENGLAND.

The larger part of the trucks used for commercial purposes in England are driven by women, because nearly all of the men drivers have enlisted for military service. For this reason many English truck buyers are purchasing smaller vehicles than they might otherwise use. There is a large demand for those of less than two tons. Some sort of a starting system is also desired to relieve the women of the necessity of cranking by physical force.

CHALMERS TO AWARD PRIZES.

Just before Christmas a great mass meeting of Chalmers employees will be held in Detroit and \$500 in prizes will be awarded for good suggestions as to the conduct of the business and the improvement of methods that have been made during the past few weeks. Prizes range from \$100 to \$1. Appointment to better positions is determined in part by the suggestions made.



Side View of King Chassis, Showing Low Set Due to New Spring Suspension—Note Wide Frame Channel.

NEW S. J. R. LIGHT WEIGHT MODEL.

A NEW light weight car of distinct European appearance is the SJR boulevard roadster, manufactured by the S. J. R. Motor Company, 126 Massachusetts avenue, Boston, Mass.

The motor is of the four-cylinder, four-cycle, water cooled type. The cylinders are cast en bloc and have a bore of $3\frac{1}{4}$ inches and stroke of five inches, developing between 25 and 30 horsepower. The water cooled head is removable, which greatly facilitates the removal of carbon. The crankshaft, which is of the two-bearing type, is made of chrome nickel steel, triple heat treated.

The clutch is a special disc type and is so designed as to afford smooth operation. It requires but little adjustment. It connects the motor with

expressly for this motor. It is designed to secure great pulling power at low speeds, quick pick up and extreme fuel efficiency at high speeds. The gasoline is supplied by gravity from a 13-gallon tank carried in the cowl.

In conformity with standard practise, the SJR is driven from the left side, the control levers being in the centre. The gearshift lever has positive locks for each of the four gear positions. The spark and throttle levers are mounted on the steering wheel.

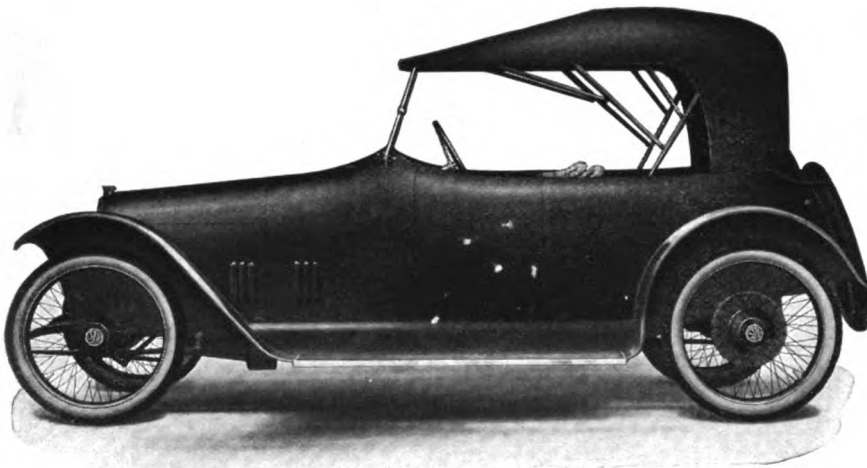
All dash instruments are mounted flush on a board of highly finished natural wood. These instruments are readily seen by the driver and include the Standard 60-mile speedometer, which has total and trip dials, and is driven from the transmission. There also are an oil gauge, magneto and light switches, two ammeters, gasoline indicator and gasoline filler cap. The steering wheel is of the worm and sector, irreversible type, and is operated by a 17-inch wheel that is located so as to afford maximum comfort for the driver. The windshield is a single piece of French bevel plate glass, and is of the clear vision, rain vision, ventilating type.

The wheelbase of the car is 108 inches and the tread 56 inches. Particularly easy riding is effected by 48-inch chrome vanadium rear springs of the cantilever type that are so slung as to minimize all road shocks.

The rear axle is a full-floating type, with low carbon case and hardened steel differential, pinion and ring gears. Ball bearings are used throughout. The high carbon steel frame is original in design.

The pressed steel body has capacity for three passengers and is built on racy type lines. It is finished with a special dull surface and is luxuriously upholstered in process leather.

The standard equipment includes a one-man top and dust envelope, two headlights with dimmers, tail light, dash light, vibrating horn, tool kit, jack, pump, tire repair outfit and wheel carrier. The car is listed at \$855 f. o. b. factory.



The SJR New Boulevard Roadster, Priced at \$855.

a selective type sliding gear transmission, which bolts directly to the rear side of the bell housing on the motor case. This construction forms a unit power plant that is supported at three points. All gears in the transmission case are of high carbon steel, triple heat treated.

Cooling is by the thermo-syphon principle through a radiator of original European design, and of unusually large capacity. Lubrication is by a plunger pump, which is driven from the half-time shaft. A constant spray of oil affords ample lubrication to all moving parts of the motor. Current for ignition is supplied by a high-tension magneto that is accessibly mounted and is driven from the half-time shaft. Starting and lighting are effected by a six-volt, single unit system with a six-volt storage battery of ample capacity.

The carburetor is a special design, developed



THOUGH the multiple cylinder models at the New York show probably will attract the largest share of attention, the new low-priced cars are certain to be thoroughly examined by a large number of actual prospective motor car purchasers.

Keen interest in the fours has been greatly stimulated by the numerous announcements of price reductions during the past half year. Four-cylinder models are now offered at prices that were deemed visionary a year ago, when it is considered that they are equipped with electric starting and lighting systems, demountable rims and other features that usually are associated with higher priced cars.

One of the most notable instances of these completely equipped cars is the new model brought out by the Willys-Overland Company, which sells at \$615 for the touring model and \$595 for the roadster, both being fully equipped and provided with electric starting and lighting systems. Last year the lowest priced Overland car with the same amount of equipment retailed at \$850.

Some of the newer companies, such as the Saxon, have preferred to keep the selling price of their models at the level established last year, but have added to the car's equipment and to its intrinsic value in many other ways. But, in general, cars that cost \$1200 last year are now priced at approximately \$1000; cars that cost \$1000 now sell for about \$850, and those formerly in the \$800 division can now be obtained for about \$600.

Overland Is Very Prominent.

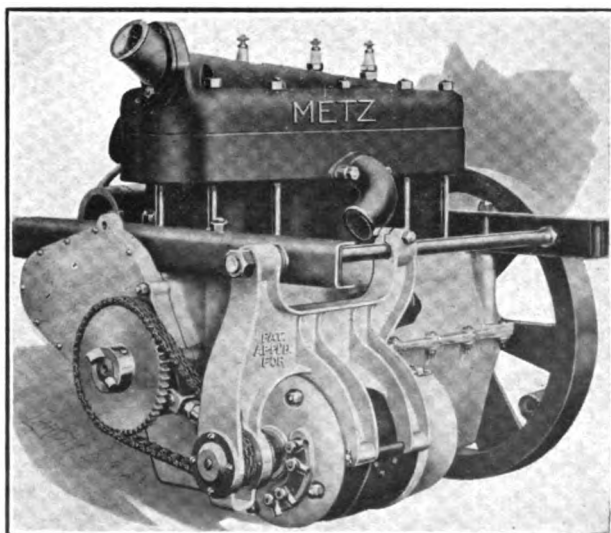
Of the new low-priced fours none, perhaps, will attract more attention than the Overland model. This car is equipped with an electric

starting and lighting system, high-tension magneto, speedometer and the usual Overland button control board on the steering column.

The car has the standard 56-inch tread and a wheelbase of 104 inches, which is sufficient for a roomy five-passenger body. It weighs complete 2160 pounds. There are some new principles applied to the mechanism.

The motor differs from previous Overlands in that the cylinders are cast en bloc instead of singly. The bore is $3\frac{1}{4}$ inches and the stroke five inches. Two main bearings support the crankshaft and the power plant is mounted in the frame at three points.

The thermo-syphon cooling system is used and a large fan runs on ball bearings. The radiator is of the cellular type, through which the wa-



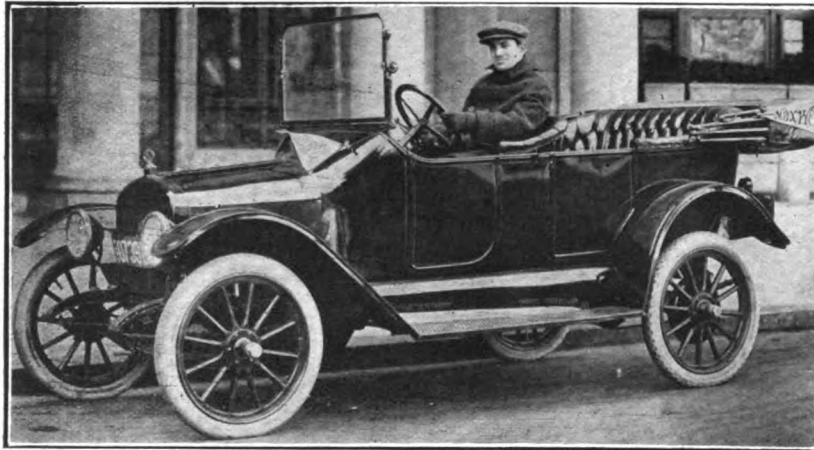
Power Plant of the Metz Four.

ter circulates vertically. Ignition is provided by a high-tension magneto, which is installed entirely separate from the starting and lighting system.

No dry cells are required for starting. The starter draws from the magneto. The wiring has been reduced to the most simple arrangement possible and similarly the lubrication is a straight splash system with a plunger pump to keep the oil in the crank case at a constant level.

The carburetor is equipped with a hot air arrangement to warm the gas. The clutch is the conventional Overland leather faced cone, and is equipped with a simple clutch brake to facilitate gear shifting. Springs under the leather insure gradual engagement.

The three-speed transmission is carried on the rear axle, which is a floating type with four bevel differential gears and a removable shaft that operates on annular ball bearings. The brakes



The Popular Maxwell Light Car.

are much larger than is usual with a car of such light weight.

Cantilever Springs on Rear.

Cantilever springs, which were tried out first by the Overland company on its Knight engined model, are used at the rear. The front springs are semi-elliptic. Electric control buttons are mounted on the column, which supports a 17-inch steering wheel in such a way that the buttons can be reached without bending forward.

The car is upholstered in fabrikoid. There are pockets in the wide U doors and there is a tool compartment under the rear seat. The electric equipment includes a two-unit, six volt electric starting and lighting system, with head, tail and dash lamps, headlight dimmers and an ammeter to register the volume of current.

There is also a one-man top, a built-in windshield, a magnetic speedometer and electric horn.

combination tail light and license bracket, hinged robe rail, foot rest, tire carriers in the rear, extra demountable rim, full set of tools and several minor items.

Saxon Low-Priced Four.

The price of the Saxon four-cylinder roadster remains at \$395. The car now has a three-speed gear set instead of one with two speeds, and the body has been redesigned and has a neater and more attractive appearance. This car is not equipped with an electrical system as standard equipment, but one can be installed at the factory at an extra cost of \$50. Regular equipment includes oil side lamps and acetylene headlights.

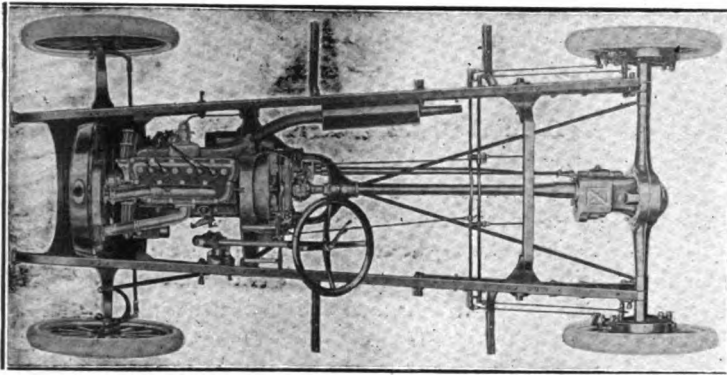
The clutch and brake pedals are adjustable to the requirements of the driver. Brakes have been increased to two inches in width and they operate on a drum eight inches in diameter. The motor is cast en bloc and has cylinders of $2\frac{3}{4}$ -inch bore and four-inch stroke. The carburetor is a special Mayer type and is provided with air and fuel adjustments on the dash. Fuel is fed by gravity from a six-gallon tank located under the dash. The Atwater Kent ignition system takes its current from a storage battery. The oiling system is a combination of force feed to the main bearings and splash to other points. A multiple dry disc clutch with plates faced with Raybestos is used. The rear axle is a semi-floating type. The wheels are 28 inches high and this year are of the artillery type. Clincher tires are standard equipment.

Metz Friction Disc Transmission.

Another well known light car is the Metz. It has been conspicuous for years because it incorporates the use of the friction disc transmission, which yields an unlimited number of speeds. The cylinders are vertical and are cast en bloc. Three main bearings of exceptionally ample dimensions support the crankshaft.

The camshaft is enclosed within the crank case, which is cast in two parts, each of which bears one side of the main bearings. The lower half, which is the oil well, can be removed to adjust the engine parts without disturbing the main bearings.

A gasoline tank containing 10 gallons, which is sufficient for about 250 miles, is carried under the cowl. The fuel is fed to the carburetor by



Chassis of the Smallest Overland.

gravity. The ignition spark is supplied by a Bosch magneto. The oil is maintained at a constant level in the crank case by a pump and is distributed to the motor by the splash system.

Water circulates through a vertical tube radiator by the thermo-syphon system. To insure proper cooling under all conditions the radiator has exceptionally large capacity.

The starting and lighting system consists of a dynamo, starting motor battery regulator, cut out, switches and indicator. The Gray & Davis six-volt system, with a light three cell battery, is employed.

Wheelbase is 105 inches and tread 56 inches. The wire wheels are equipped with 32 by 3½-inch Goodrich clincher tires. The fiber grip gearless transmission consists of a large disc against which a fiber covered wheel is run. By moving this wheel toward the centre of the disc, low speeds are secured, and by moving it toward the outer edge, high speeds. The shaft, which is operated by the disc, propels a silent chain, which passes around and drives the rear axle. The chain is fully enclosed against dirt and to obtain maximum lubrication. This transmission functions also as a clutch.

The rear axle is a tubular self-contained type, and is mounted on Hyatt roller-bearings. The bearing housings serve as supports for the springs. The right and left members of the rear axles are united by a spur differential to the driving sprocket. Hubs are fastened to the axle ends by means of long broached interlocking teeth, which are held in place by screwed hub caps and a safety locking device.

The front and rear springs are full elliptic. Equipment includes a one-man top, windshield, a solid mahogany instrument board, on which all

instruments are placed, horn, tool, box, speedometer and lock switch.

The Maxwell four, which a year ago cost \$695 in the touring model, was reduced in the spring to \$655 and is now being offered for \$615. The car is equipped with a complete electrical system and every convenience that can be desired.

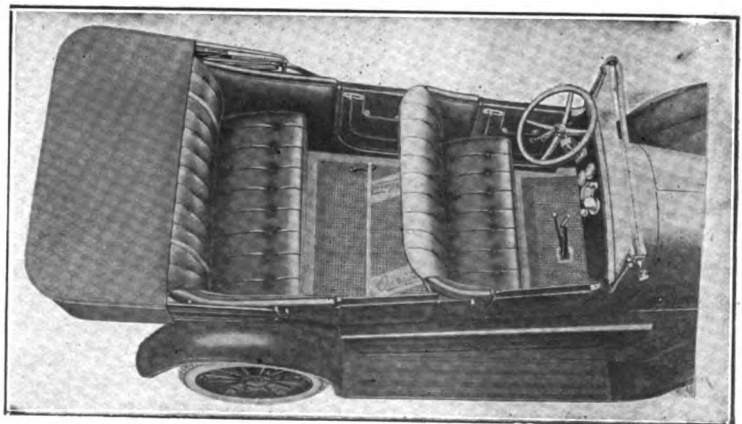
The four-cylinder bloc motor is a Maxwell production and has bore of 3⅝ inches and stroke of 4½ inches. Cylinders and crank case are integral and the cylinder heads are detachable. The crank case is of aluminum. The valves are located at the right hand side. Ignition is supplied by a Simms-Huff high-tension magneto.

Cooling is by thermo-syphon system and the design includes large sized inlet and outlet connections. The splash system of lubrication is used. A pump delivers oil at four points to assure a constant level in the crank case. Fuel flows by gravity from a tank under the dash.

The clutch is a cone type of aluminum running in oil to insure its taking hold evenly and surely. A three-spced sliding gear transmission is used. The rear axle is a three-quarter floating type. The front springs are semi-elliptic, while the rear springs are three-quarter elliptic. The artillery wheels carry 30 by 3½-inch tires.

Equipment includes electric headlights provided with dimmers, storage battery, electric tail light, electric horn, one-man top, clear vision and double ventilating windshield, speedometer, spare tire carrier with extra demountable rim, pump, jack, special wrenches and tools.

The Dort company offers a touring model for \$650 and a roadster for \$495. In both cases an electric starting and lighting system can be supplied at a cost of \$45 extra. The motor in both



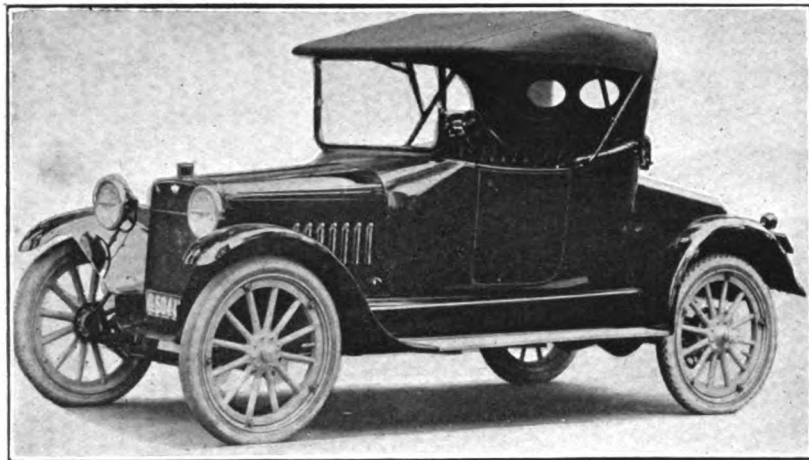
The Overland Body Arrangements.

cars has four cylinders, cast en bloc. In the touring car the bore is $3\frac{1}{4}$ and the stroke five inches. In the roadster the bore is three inches and the stroke four inches. Cylinders are of L head design.

A cone clutch is used in both Dort models and the gearset is a three-speed selective type. Rear axles are full floating and have drive shafts, pinion and differential gears of nickel steel. Other features include thermo-syphon cooling, a splash lubrication system in which the oil level in the crank case is constantly maintained by a pump in four crank case compartments, and gravity gasoline feed.

The wheelbase of the touring car is 105 inches and of the roadster, 92 inches.

This car has been sold in such large quantities that in the number of cars shipped the Saxon



The New Saxon Roadster.

company is now one of the six largest in the country.

SCRIPPS-BOOTH BIG YEAR.

A year ago the Scripps-Booth Company began the production of a luxurious light car and in that time it has sold large numbers of them in every city in the country, while sales of a million dollars worth have been made in Europe.

This demand for a light car of the most modern and finely equipped type has proved so great that the company has now undertaken to produce an eight-cylinder chassis, which will increase the mechanical refinement offered by its product. The four-cylinder will be continued.

The eight-cylinder car will sell for about \$1100. In exterior appearance it will be identical with the present Scripps-Booth car. The only changes will be to strengthen the parts to with-

stand the greater strain put upon them by the larger motor, which will develop 35 horsepower at 3000 revolutions per minute.

FEDERAL TAX SCHEME UNPOPULAR.

Protests have arisen everywhere over the administration plan of raising revenue for the preparedness programme by taxing gasoline, automobile horsepower, pig iron and fabricated steel. Motorists throughout the country are aroused against it. Oklahoma and other oil producing states share their feeling, while Michigan, where automobiles are built, and the Pennsylvania steel district, are opposed with equal unanimity.

Attention is called particularly to the severity with which these taxes fall on the automobile industry, and the complaint is made that by taxing gas engines, while steam engines are not taxed and animal power is left untouched, the plan interferes with natural competition and puts a handicap on progress.

Secretaries of automobile clubs are busy everywhere pointing out the numerous taxes that the motorist already pays. In Ohio, where the average horsepower of cars is about 30 and the average value about \$800, the annual taxes already amount to about \$17.75. The horsepower provision alone would add \$15 to that amount, not to mention the other taxes.

While motorists generally believe the taxes bear too heavily on them, they realize that a similar back pressure against the new taxation is likely to result wherever the taxes are placed.

The tour of the officials of the Dixie Highway Association over the western division of the road this year was so successful in arousing enthusiasm for road improvement that it is proposed to hold a tour over the eastern division next year.

By that time improvement is expected to have progressed so far that travel will be easy and that it will be possible to invite motorists in general to take part in the tour. The cadets of the Northwestern Military academy, who went over the Lincoln highway this year with armored cars, will be asked to participate and demonstrate their war like equipment in various towns along the way.

MOTOR STARTING AND CAR LIGHTING.

The USL Single-Unit Inherently Regulated System, Which Is Exceedingly Simplified, Has But One Rotating Part, and Has "Drooping" Charging Characteristic.

THE starting and lighting systems developed by the United States Light and Heating Company, Buffalo, N. Y., differ radically from those produced by other concerns in that they are what are known as flywheel types, that is, the motor-generator is practically a single unit, being attached to the shaft of the engine in the place of the flywheel, ahead of the clutch, and which is completely enclosed. While the diagram shows a multiple disc clutch, the system may be used with this type or with cone clutches.

These systems are used on some of the best known pleasure cars and have been found to be extremely efficient and enduring, and claims are made for them by the maker that are extremely broad with relation to economy of power and maintenance of batteries.

All of these three systems are similar in that the motor-generator is enclosed in the housing that would cover the flywheel, and with this is included the clutch, so that the engine and clutch are a unit. The flywheel housing externally does not differ in appearance from conventional construction and because the motor-generator is concealed the engine case is free from the one or two units that are necessary with other systems, and no chains, clutches, pinions, reduction gearing, etc., is required.

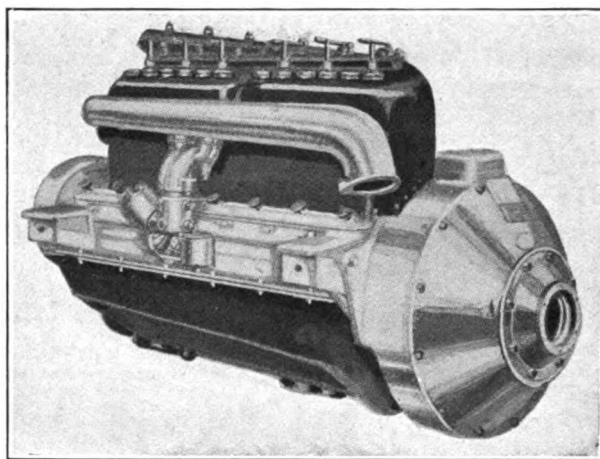
The motor-generator weighs approximately the same as the average flywheel and there is a considerable saving in the weight as compared with other systems. The simplified construction necessarily minimizes the possibilities of complications and needs of adjustments are materially reduced. Claim is made that with the inherently regulated system there is no possibility of adjustment, for after leaving the factory no relation can be changed through normal use.

External Regulation First Developed.

The external regulated system was the first developed, and this is built in what is known as the 24-12 volt and the 12-6 volt sizes, the designations indicating by the first figures that the starting voltage is 24 or 12 and the generating voltage is 12 or six. The designation externally regulated implies that a regulator is used outside of the machine to open and close the circuit from

the generator to the battery and from the battery to the generator, so that there will be no damage done the machine through high or very low engine speed. The inherently regulated motor-generator automatically adapts itself to all operating conditions, will supply current to the battery so long as this is needed and governs the flow of current so that there cannot be an abnormal discharge from the battery into the generator, this being done by the arrangement of the armature windings.

While the externally regulated systems are in use the statement is made by the company that the inherently regulated system will be the one that will be sold as standard car equipment be-



The USL Starting and Lighting System, Completely Enclosed, Fitted to a Six-Cylinder Engine.

cause of its greater simplicity, and for this reason better meeting the requirements of the motorists. This system is built to develop 24 volts for starting and 12 volts for generating current.

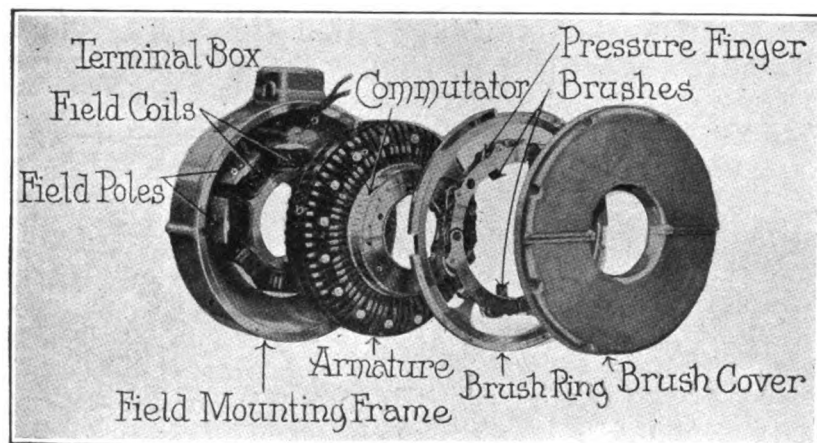
The Inherently Regulated System.

Because the inherently regulated system is regarded as standard equipment, this description will be devoted to that type. The system consists of a motor-generator, a storage battery, a starting switch, an automatic switch and a touring switch. The motor-generator starts the engine and supplies the current for the storage battery, the starting switch causes the machine to function as a motor, the automatic switch closes and opens the

circuit between the motor-generator and the battery whenever necessary, and the touring switch is used to open the circuit when long rides are taken to prevent excessive charging of the battery.

The system uses a 12-cell battery, which has sufficient capacity for all demands that may be made upon it and yet the weight is comparatively light. The motor-generator is used with either a single wire (grounded) system or a full metallic wiring, according to the preference of the builder of the car. Either will afford satisfactory operation, but the wiring, aside from the connection of the lights, is extremely simple, there being one or two short cables from the motor-generator to the battery and four leads from the motor-generator to the instrument board.

The motor-generator consists primarily of two parts, the field frame or stationary member.



The Four Components of the USL Single-Unit System Partly Disassembled to Show the General Construction.

which is bolted to the bell housing of the engine crank case, and the rotator or armature, which is bolted to the engine shaft. The frame is in reality a metal spider that carries a wide collar on which the eight pole or field pieces are bolted. The field pieces are made with concave bases to fit the outside of the collar of the frame and the heads of the poles are rectangular, with convex surfaces, these being arranged so that the heads cover the greater part of the surface area of the internal circumference of the rotator. The field pieces are wound with wiring, shaped on forms, that is thoroughly impregnated with an insulating compound.

This frame is bolted to the housing. It is so formed that there is a web that projects to the outside line of the field coils, to which is bolted the brush carrier. When mounted the crankshaft rear flange projects through the collar of the

frame, and to this flange is bolted the collar that carries the rotator, which corresponds to the armature. The rotator first of all consists of a wide collar that carries what may be termed a disc or flange. The collar serves as a seat for the large circumference and narrow commutator, and the flange carries at the edge opposite the commutator the windings. These windings extend entirely around the edge of the rotator flange and are so shaped that when the rotator is installed on the collar that carries what would be the fly-wheel end of the clutch, the windings completely surround the field poles and coils mounted on the frame. The leads from the windings are carried over the flange to the commutator segments, the entire assembly being secured by a series of bolts.

Large and Narrow Commutator.

The commutator is composed of a large number of L shaped copper segments, this construction being necessary because of its size, and the coils are comparatively small. The rotator coils are thoroughly insulated by impregnation with a dielectric compound, and the commutator is insulated with bakelite in which the segments are imbedded and which separates them. The brush holder frame consists of three rings that are made with lugs, arranged concentrically, the largest ring being bolted to the field frame by the lugs and the smaller rings being bolted to the large ring by lugs, the inner rings carrying the metallic-carbon compound brushes

between them.

When the motor-generator is assembled it is exceedingly compact and, as may be noted from the description, the rotator is bolted to the crankshaft and it revolves between the brushes and the field coils. The brushes are carried in pockets and are forced into contact with the commutator by springs. The brushes are what are known as the angular type, that is, the brush bears squarely against the side of the pocket away from which the commutator rotates, and the faces of the brushes rest on the commutator at a slight angle. Aside from the adjustment of the brushes from time to time as this becomes necessary from wear, there is nothing in the entire construction that requires adjusting.

Rotator Carried on Engine Shaft.

One will note that no lubrication of the motor-generator is required. The engine shaft car-

ries the only moving part and this is or ought to be constantly and satisfactorily lubricated. As the rotator or armature is attached to the engine shaft and turns with it, as would a flywheel, it serves the same purpose as a flywheel—that is, it stores the energy or power of the engine and through inertia carries the reciprocating parts and the entire load against all retarding influences. The rotator is not a light or delicately built part. To the contrary, it is very substantial and enduring, and statement is made that the construction will resist a speed very much higher than can ever be attained with any internal combustion engine.

Perhaps a word of explanation is necessary at this juncture. The reader has been informed in previous articles that generally speaking power is obtained with electric motors through speed, and that this speed is obtained by energizing the machine by a current that is sent to the armature. The series wound motor is used very generally for vehicle propulsion because of its characteristic of absorbing a given value of current, that is, it will to a very marked extent control itself with the load that it carries. Without a load a quality of a series wound motor is to accelerate to very high speed, so high in fact that it will ruin itself from rapidity of movement, and with a load the machine will practically govern itself, consuming a stated current. With the series motor all of the current delivered to the armature goes through the field coils before it goes out of the machine.

Motor-Generator Characteristics.

The motor-generator, however, must have a different construction, for it is required as a motor to take a heavy load and carry it to a point where the engine will operate from its own power, and then it must become a generator as the speed increases and generate a current of practically a constant value. Such a machine is generally compound wound—that is, it has two coils for each pole. The shunt coil takes a shunted current and the series coil takes the full current, and by proportioning the windings the voltage of the current sent from the generator may be kept at an approximate standard.

The motor-generator of this system must first start the engine, which it does by comparatively slow action, instead of through the leverage of reduction gearing, and when the engine has begun to fire steadily it becomes a generator and will deliver approximately a given value of current to the battery through its inherent regulation. The claim of the manufacturer is that this means of regulating is superior to any other in that it has

what is known as a “drooping characteristic,” that is, while the current that is generated quickly rises to maximum output at low speeds, from this highest point the output is gradually decreased as the speed increases.

Charges at Slow Engine Speed.

This means that the generator will shortly after starting begin to charge the battery, and as the speed of the vehicle is increased, which carries with it an increasing number of engine revolutions a minute, the voltage will remain constant and the amperage will be diminished gradually. This graduated diminution of the current insures against overcharging, and yet as the battery is drawn upon for starting, as well as lighting, the current production ought to be sufficient to meet the requirements of frequent starting, as well as

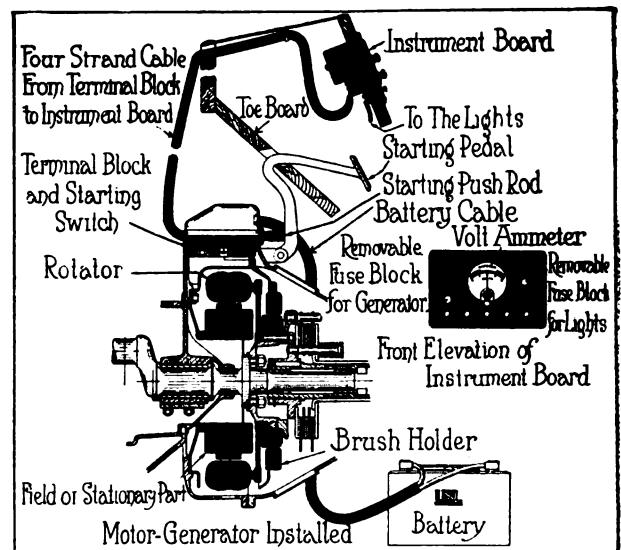


Diagram Showing the Installation of the USL System to a Chassis and the Locations of the Different Elements.

the lighting load without materially lessening the energy available in the battery.

The statement is made in connection with the current production that the results are ideal for the average use of pleasure cars because frequent starting affords but short periods for battery charging, and this condition obtains where the car is generally driven slow, as in the city. As frequent starting means the heaviest drains upon the battery, the greatest current production ought to be when the most current is used, and beginning charging means longer periods for full current generation, so that charging is really obtained with smaller current. When the stops are less frequent the charging is afforded continuously at slower rates. The power required for this form of current production is but $12\frac{1}{2}$ per

cent. of that required with the earlier forms of the U-S-L system.

Maximum of Current Production.

As the speed of the vehicle is increased the amperage of the current generated is lessened—that is, there is a decreasing flow up to the maximum speed of the car. As a matter of fact this maximum output is reached, beginning with less than two amperes at 250 revolutions a minute, at not quite 500 revolutions, when about $12\frac{1}{2}$ amperes is produced, gradually decreasing to $9\frac{1}{2}$ amperes at 1800 revolutions. With other means of current generation current production is begun at not less than 300 revolutions, which is grad-

sprockets, overrunning clutches and the like. This means simplification mechanically and minimizes the need of such attention as would be required for any form of coupling such as would be necessary with either the single or two-unit systems. Not only this, there is an extremely simple wiring system, which is illustrated by the diagram of the installation (a side view is the phrase applied to this illustration) and the entire wiring diagram of the lighting system of the machine shows the connection with both seven and 14 volt lamps.

The use of the touring switch, so-called, will prevent overcharging of the battery in the event the car is used for long drives, for by this the generator can be disconnected and the entire power produced by the engine is available for propelling the vehicle. The switch is manipulated by hand, it is convenient to reach, and the protection it affords is a factor that is claimed to be worthy of consideration.

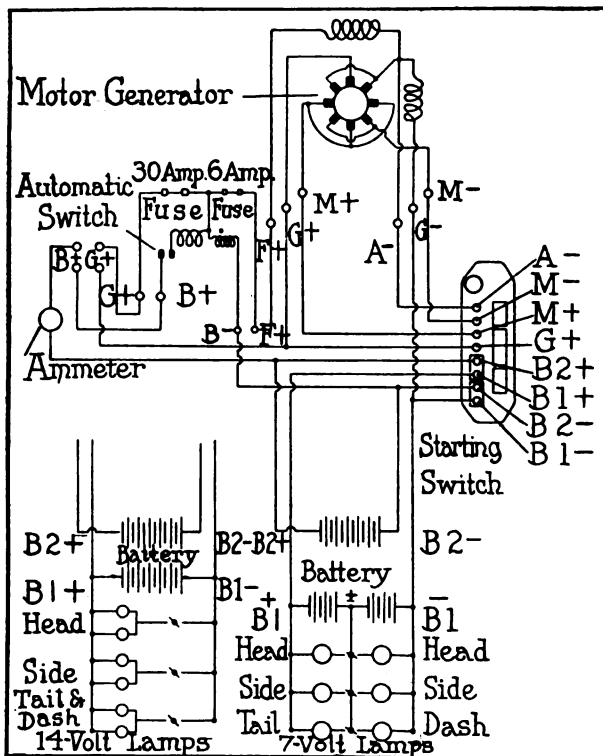
The starting switch, by which the engine is started, is built into the casing of the motor-generator and it is operated by pressing a foot pedal. The automatic switch or reverse current relay is in the circuit between the motor-generator and the battery and it will close when the speed of the rotator is reached, at which it will generate current having a voltage in excess of the voltage of the battery, and when the speed of the engine is lessened the switch will open and prevent the current from the battery flowing to the motor. The functions of the rotator serving as a motor and as a generator are practically controlled by this switch.

In the dash or instrument board of the car is placed a small plate that carries a volt-ammeter, the touring switch, the switches that control the head, side and tail lamps, as well as the removable fuse blocks for the motor-generator and the lighting circuit. This is centralization of all the control members, which is desirable from several points of view.

(To Be Continued.)

The Chalmers Motor Company has established at its factory a mechanical school, where young employees will be trained in their work. The school is under the direction of S. H. Humphries and is designed to make the factory apprenticeship of real value.

The American consul at Aden, Arabia, reports a demand for jitney 'buses in that city. Motor cars are already carrying the bulk of passenger traffic.



Wiring Diagram of the Inherently Controlled USL Starting and Lighting System and the Instrument Board Connections.

ually increased to from 14 to 17 amperes at 1800 revolutions, according to graphs making comparison of the current production of this system and others. The statement is also made in connection with this system that there is perfect commercial commutation at any speed at which an engine can be driven.

In comparison of the construction there is but one rotating part and there is no need of any method of coupling with the engine such as is necessary with any other form of motor or generator, obviating the use of gears, chains and

GENERAL NEWS OF THE INDUSTRY.

Willys-Overland May Earn \$13,000,000—Premier to Be Built by \$2,500,000 Corporation—Republic Rubber Taken Over by Fisk.

WILLYS-OVERLAND officials are understood to be confident that the company's fiscal year to end Dec. 31 will show net profits that will exceed preliminary estimates of \$12,000,000 by between \$500,000 and \$1,000,000. For 1916 it is believed that a minimum showing of profits should be \$15,000,000, a figure which would equal better than 65 per cent. on the present \$21,000,000 of common, after taking out the seven per cent. on the \$15,000,000 preferred, as will be done after issuance of the recently provided new stock.

A notable feature concerning the Willys-Overland Company is that its capitalization has remained practically stationary in spite of tremendous growth in business. The sales for the year 1912, when the company was formed, were 20,845 cars. Sales for 1915 will reach approximately 90,000 cars, and for 1916 an output of 200,000 is anticipated. This means that in 1915 the company will make $4\frac{1}{2}$ times more cars than in 1912, and with practically no increase in capitalization.

President Willys is said to be fully confident that the new issue of \$15,000,000 preferred will ultimately all be converted into common stock at the established rate of \$300 per share for the common after the conversion right accrues a year from this coming January. In that event the company will have automatically reduced the par value of its capitalization by \$10,000,000.

BRISCOE IN NEW MERGER PLAN.

The Lewis Spring and Axle Company has been purchased by a newly formed Briscoe Motor Car Company, capitalized at \$6,000,000, which also includes Argo Motor Company and the Jackson Parts Company. The Briscoe concern is scheduled to make 30,000 cars during the next year.

L. E. Wilson, formerly sales manager of the Pathfinder company, is said to have engineered the merger. He will direct the sales of the new company. The Hollier eight, made by the Lewis Spring and Axle Company, will be continued in a plant recently secured by the Lewis company at Chelsea, Mich.

NEW \$2,500,000 PREMIER COMPANY.

The Premier Motor Car Company, capitalization \$2,500,000, is the name of the new corporation that came into existence soon after the sale of the plant of the Premier Motor Manufacturing Company to a syndicate. This new company will continue the manufacture of Premier cars and has taken over the T. B. Laycock Company's plant at Indianapolis, Ind., for the purpose. All the old machinery and equipment of the old Premier company will be transferred as soon as the manufacturing company now occupying the Laycock factory can move.

The new Premier company is composed of a syndicate of bankers and manufacturers from Joliet, Ill.; Detroit and Indianapolis. The leaders are given as follows: J. C. Flowers of the Gerlach-Barlow Company, Joliet; E. W. Steinhart, Indianapolis; C. F. Jensen, president of the Vanguard Company, Detroit; F. W. Woodruff, vice president of the First National Bank and the Woodruff Trust Company of Joliet, and president of the Illinois Bankers' Association; T. R. Gerlach, vice president of the Gerlach-Barlow Company, Joliet, and H. L. Thompson, secretary of the same company.

It is believed that about 3500 men will be employed when the Laycock plant is ready, and that cars will be produced in large numbers. The plant, real estate and equipment have an appraised value of approximately \$1,000,000, and it is said that there are no mortgages or debts of any kind against the company or the plant.

FISK TAKES FEDERAL RUBBER.

The interests of the Fisk Rubber Company, Chicopee Falls, Mass., have purchased control of the Federal Rubber Manufacturing Company and hereafter will direct the policies of that company.

Byron C. Douse has resigned as president and general manager of the Federal company and has disposed of his holdings. H. T. Dunn has become president, with Benjamin H. Pratt as general manager.

At the stockholders' meeting the following directors were elected: H. T. Dunn, B. H. Pratt, J. A. Kepperly of Toledo, H. A. Githens, R. C. Ward of Milwaukee, H. G. Fisk, E. H. Broadwell, G. A. Ludington and E. N. Bogardus of Springfield, Mass.

The officers, in addition to Dunn and Pratt already mentioned, include H. A. Githens, assistant general manager; H. G. Fisk, treasurer; R. C. Ward, secretary and assistant treasurer; E. M. Bogardus, comptroller.

The two organizations will be maintained separately as regards selling and manufacturing. The Fisk plant will be devoted entirely to production of pneumatic tires, while the Federal will not only make tires, but a general mechanical line of rubber goods as well.

WILLYS DENIES MERGER STORY.

John N. Willys, president of the Willys-Overland Company, Toledo, O., absolutely denies the rumors that the Overland company is to take over the entire selling department of the Peerless Truck and Motor Corporation of Cleveland. Mr. Willys states that neither he nor the company he heads is directly or indirectly connected with the Peerless or General Electric companies, and that stories and rumors of any merger with the Willys-Overland Company are absolutely false.

JAMESON TAKES TWO YEARS' REST.

C. S. Jameson, vice president and director of the Willys-Overland Company, Toledo, has resigned his offices in that company in order that he might take a much needed rest. He has been in ill health for the past several months and now finally accepts President J. N. Willys' suggestion that he take a long vacation to recuperate. He is to take a two years' leave of absence, spending this winter in Florida.

Mr. Jameson was stricken about eight months ago with a very serious illness and was confined to his home for some time. He sojourned at Mt. Clemens, Michigan's health resort, and spent the past summer on the Pacific Coast, but failed to fully recover his former good health. He now is compelled to give up all commercial responsibility for a while.

HUPP CAPITALIZATION APPROVED.

Stockholders of the Hupp Motor Car Company, Detroit, have approved the plan of refinancing the company, under which assets and ownership of the business will be immediately transferred to the Hupp Motor Car Corporation of Virginia. The officers of the new company are to be the same as of the old, as follows: J. Walter Drake, president; J. R. Drake, vice president and secretary; Edwin Denby, treasurer. Control of the stock and direction of the policies of the company remain as before.

The recapitalization plan of the company has thus received official approval, and the sale of \$1,500,000 preferred stock in the new company has been ratified. The purchase of the American Gear and Manufacturing Company, Jackson, Mich., has been consummated and plans are being laid for material enlargements to the Detroit and the Jackson plants, to make possible the production of 20,000 cars next year.

WILLYS FORMS MARKETING COMPANY.

Willys-Overland, Inc., has been organized under the laws of Virginia to take over the sales departments of the Willys-Overland Company of Toledo. It is capitalized at \$500,000. John N. Willys is president; H. T. Dunn, H. L. Shepler and C. A. Earl, vice presidents; Walter Stewart, treasurer, and R. R. Scott, secretary.

CHASE OFFICERS FOR 1916.

The Chase Motor Truck Company, Syracuse, N. Y., has elected the following as officers for the coming year: A. M. Chase, president; H. P. Bellinger, vice president; E. A. Kingsbury, secretary and treasurer. H. T. Boulden is general sales manager and J. E. Gramlich chief engineer.

AJAX RUBBER COMPANY, INC.

The Ajax Rubber Company, Inc., was formed recently with a capital stock of \$5,000,000 to take over the former Ajax-Grieb Rubber Company, Inc., of New York City and Trenton, N. J. The new stock is all common, each share having value of \$50. Of the total

\$3,000,000 is to be issued at once. Part of the stock will be exchanged for outstanding stock of the Ajax-Grieb company and part will be sold.

No change is to be made in the management of the business, the present owners retaining a substantial interest in the enlarged company, and continuing in control of Ajax-Grieb affairs as officers and members of the directorate.

MCBETH GOES TO WESTCOTT.

Reid S. McBeth, Richmond, Ind., has joined the Westcott Motor Company as advertising manager. He will handle the publicity of the company under the direction of H. P. Mammen, general sales manager. Mr. McBeth was graduated from Purdue university in 1909 and since that time has been a newspaper man, his last connection of the kind, before joining the Westcott organization, being the Indianapolis Star.

LINK JOINS WILSON COMPANY.

Vincent Link, chief engineer of the former Universal Motor Truck Company, Detroit, and for many years engineer in the truck department of the Packard Motor Car Company, has joined the J. C. Wilson company as consulting and designing engineer, and will design for this company a new two-ton model of the Wilson truck.

CANADIAN FORD CAPITAL INCREASE.

Stockholders of the Ford Motor Company of Canada, Ltd., have authorized the distribution of a 600 per cent. stock dividend and an increase in capital from \$1,000,000 to \$10,000,000. Each stockholder will receive seven shares of the new stock for one of the old, based on the price of \$400 now asked for the new stock. The original shares of the company are worth \$2800 each.

PURITAN BUYS MORE PARTS.

Service and repair parts of the Scripps-Booth Cycle Car Company can now be obtained from the Puritan Machine Company, Detroit, that organization having recently taken them over. This purchase brings the total of similar acquisitions up to 71 companies.

CHALMERS ADDS MORE MEN.

C. M. Logan, formerly wholesale manager of the Cuyahoga Sales Company, Cleveland, and with experience on the sales staffs of the Studebaker, Oldsmobile and Lozier companies, has joined the Chalmers Motor Company as district manager in charge of territory in West Virginia, Ohio and Kentucky.

Jean M. Falk resigned from the Jeffery Motor Car Company several weeks ago to become special representative of the Chalmers company, with headquarters in Detroit.

H. L. Pelton leaves the Pacific Coast to take up Chalmers work as district manager in the East, with the State of New York as his territory.

BIG INDIANA MERGER PROJECTED.

The rapid announcements of big combinations in the automobile field that have followed one another rapidly during the past few weeks are continued by the report that a number of the leading producers in Indiana are to be combined in order that the purchasing power of all the plants together may be used to compete successfully with the great Michigan combinations.

While the fact that the formation of such an organization is underway has been admitted, the exact details of the plan have not yet been made known. The companies said to be involved are the Cole Motor Car Company, Indianapolis; the Westcott Motor Car Company, Richmond, Ind.; the Auburn Manufacturing Company, Auburn, Ind.; the Inter-State Motor Car Company, Muncie, and the Peru Auto Parts Company, Peru, Ind.

C. P. Henderson, sales manager of the Cole Motor Car Company, and formerly head of the Henderson Motor Car Company, admitted that the deal was pending, but said that it had not yet progressed to the point where an announcement could be made.

When it is complete it is said that at least 12 companies will be included, and that the capitalization of the company that is to be formed will be between \$20,000,000 and \$30,000,000.

CONSOLIDATED CAR INCREASES CAPITAL.

The Consolidated Car Company, Detroit, maker of Abbott-Detroit cars, has for the second time this year increased its capital stock. It is now \$500,000. Last June it was raised from \$100,000 to \$200,000. Of the \$300,000 recently added, \$200,000 is to be sold immediately. The balance is to be held in reserve in the treasury. Par value is \$10 a share, and it is reported that a great deal more than half of the stock has been subscribed for.

The personnel of the company will remain as before: C. L. Lewis, president; R. P. Hull, treasurer; A. W. Gardiner, secretary; D. L. Gardiner, director of sales; J. J. Gardiner, assistant treasurer. Morgan J. Hammers is vice president and director of engineering. D. E. Perry is factory manager. C. J. Osborn and F. E. Sangbush are general superintendent and sales manager, respectively.

NEW FISK PUBLICITY MANAGER.

George B. Hendrick, Winthrop, Mass., well known advertising manager in the newspaper field, has joined the Fisk Rubber Company, Chicopee Falls, Mass., as manager of the newly created publicity department. He will have also charge of printing and will edit the company's house organ. Mr. Hendrick was with A. Mugford Corporation, Hartford, Conn., as sales manager. He joins the Fisk company direct from the George B. Ellis Company, Boston.

SNELL WITH INTER-STATE.

Frank E. Snell, formerly of the Service Motor Truck Company and the Garford Motor Truck Company, has been appointed production manager of the Inter-State Motor Company, Muncie, Ind.

TO MAKE OWEN MAGNETIC.

Further extension of the activities in the automobile field of the General Electric group is indicated by the announcement that the Baker-R & L Company will in the future make the Owen magnetic car with the Entz transmission, patent rights for which were recently taken over by the General Electric Company.

There will be a representative of the General Electric Company on the board of directors. R. M. Owen, president of the Owen Magnetic Company, will be vice president and director of sales of the new company.

Two sizes of magnetic car will be made, one of which will be a continuation of the present Owen magnetic and the other a smaller car. The General Electric factory at Fort Wayne, Ind., has been equipped to make the Entz transmission for the new company, and for any other makers that may wish to turn out a similar car. The Baker-R & L concern will continue also to turn out storage battery electric passenger cars and trucks.

The new company will continue as the Baker-R & L Company, but with capital stock of \$5,000,000 instead of the present capitalization of \$2,500,000, of which \$750,000 is preferred and \$1,750,000 is common stock.

The present officers of the Baker company are C. L. F. Wieber, president; F. R. White and C. E. J. Lang, vice presidents; R. C. Norton, treasurer; F. W. Treadway, secretary. The board of directors consists of D. Z. Norton, J. H. Wade, J. H. Kling, W. G. Mather and C. L. F. Wieber, Jr. To these will be added as directors of the new company and representatives of the eastern interests, R. M. Owen, R. W. Swartwout, D. C. Durland and A. W. Buchard. The last named is vice president of the General Electric Company and represents that company's interests in the Entz patents, recently secured. He is also a director of the Peerless Truck and Motor Corporation of Cleveland.



Frank E. Snell, Production Manager of Inter-State Motor Company.

EISEMANN ON PIERCE TRUCKS.

During the next year three-ton Pierce-Arrow trucks will be equipped exclusively with Eisemann magnetos, type EM4 dual, and an Eisemann coil also has been adopted. The two-ton Pierce-Arrow trucks will use Eisemann water proof magnetos, type G4. Deliveries will begin in February.

STATE MANAGEMENT OF PUBLIC ROADS.

THE rapid spread, the successful results and the continued development of the system of state management of the construction and maintenance of public roads is discussed by J. E. Pennybacker, chief of road economics of the Office of Public Roads, in a special bulletin issued by the Department of Agriculture.

Taking up the history of road construction in the United States, Mr. Pennybacker points out that the United States government undertook the development of main post roads in the early part of the 19th century, but that the development of the railroad caused the abandonment of that project and left roads in the hands of the states.

Since 1837 the cost of transporting freight by railroad has been reduced about 90 per cent. and steamship rates even more. These rates, however, have been practically constant for several years, and further economies in that direction are not now possible. In the meantime, until quite recently, highways were practically neglected. Their construction and maintenance was left in the hands of local authorities. Farmers worked out their road taxes on the roads and the work was inexpertly done and lacked plan and purpose.

Under this system the entire tax burden for the maintenance of good roads rested on farm property. This was inequitable, since lower transportation charges—good roads reduce ton-mile cost of hauling from 23 cents to about eight cents—tend to reduce prices of farm produce to the city consumer. It produced inadequate revenue and resulted in a widespread stagnation in the development of roads.

The system took no account of county and township boundaries, and many communities were called upon to construct roads which were worn out by traffic originating in other communities. Modern traffic gave rise to difficult problems of construction with which local officials were unable to cope.

Before the automobile had arrived these conditions had already made plain the necessity for state management of road construction. This became apparent first in New Jersey, which in 1891 established a state office of public roads and appropriated \$75,000 for the work. Massachusetts, Connecticut and other states followed rapidly.

The movement was greatly accelerated by the advent of the motor car. It subjected stone

roads to exceptionally destructive wear and emphasized the need of expert management of construction and maintenance. It caused a widespread agitation among automobile owners for good roads. It made possible the collection of large sums for automobile licenses, most of

—Expenditures in 1914—				
State	Local funds expended in road work by counties, townships and districts	Total of state funds, joint funds and local funds	Total state money expended for road work from outset to Jan. 1, 1915	State money available for road work, 1915
Ala...	\$2,795,000	\$3,125,925	\$460,271	\$144,000
Ariz.	603,608	1,009,733	563,210	396,883
Ark.	2,332,368	2,447,368	140,000	25,000
Calif.	9,495,281	14,670,614	8,269,942	7,000,000
Color.	1,621,950	2,601,449	821,751	85,000
Conn.	1,400,000	5,096,782	14,934,176	1,000,000
Del...	360,411	421,411	193,695	30,000
Fla...	3,450,000	3,450,000	.....	.....
Ga...	2,500,000	2,500,000	.....	.....
Idaho	1,265,000	1,358,278	372,812	200,000
Ill...	7,102,977	7,937,668	867,989	2,100,000
Ind...	13,258,761	13,258,761	.....	.....
Iowa	11,363,000	11,437,000	175,000	100,000
Kan.	5,427,424	5,436,504	20,000	11,000
Ky...	1,700,000	1,718,000	43,000	600,000
La...	4,000,000	4,461,506	461,506	145,000
Maine	1,863,000	3,537,596	4,855,864	1,000,000
Md...	2,000,000	6,997,458	14,253,142	4,572,000
Mass.	3,318,742	6,020,609	16,365,425	2,437,000
Mich.	6,715,000	9,516,224	2,207,701	1,700,000
Minn.	4,272,244	8,225,821	2,708,174	1,770,741
Miss.	2,850,000	2,850,000	.....	.....
Mo...	8,000,000	8,277,253	1,421,983	350,000
Mont.	2,553,773	2,567,289	16,000	25,000
Neb...	3,347,062	3,347,062	257,850	100,000
Nev...	240,000	240,000	20,000	.....
N. H...	1,250,000	2,052,173	2,593,450	400,000
N. J...	3,000,000	6,542,572	7,192,268	1,360,000
N. M...	371,196	527,209	510,833	175,000
N. Y...	7,741,142	29,890,473	82,638,729	15,000,000
N. C...	3,930,000	3,935,000	28,500	10,000
N. D...	2,365,000	2,365,000	.....	.....
Ohio	8,500,000	11,261,882	5,123,671	3,300,000
Okla.	3,375,000	3,375,000	20,323	15,000
Ore...	5,155,657	7,062,632	188,975	233,000
Penn.	5,500,091	10,424,580	24,259,954	5,000,000
R. I...	385,000	584,598	3,703,665	180,000
S. C...	1,000,000	1,000,000	.....	.....
S. D...	1,421,501	1,421,501	.....	.....
Tenn.	2,500,000	2,500,000	.....	.....
Texas	8,750,000	8,750,000	.....	.....
Utah	750,000	1,156,936	688,732	100,000
Vt...	723,011	1,481,467	3,186,419	400,000
Va...	2,148,436	3,915,446	2,186,895	520,000
Wash.	4,000,000	6,221,131	7,117,769	3,167,583
W. V.	2,388,000	2,532,000	121,766	11,800
Wis...	4,519,000	9,118,708	2,829,486	1,215,000
Wy...	426,448	426,448	38,237	5,000
Total	\$174,035,083	\$249,055,067	\$211,859,163	\$54,884,007

which was used in road construction.

Forty-two states have now followed New Jersey's lead and have state highway departments. In all, \$208,000,000 had been appropriated for the work between 1891 and the present.

THE OWEN MAGNETIC CAR A NOVELTY.

A Car with an Unlimited Number of Speeds and No Gears—Will Attract Much Attention At the Big Motor Car Exhibitions.

NEXT to the multi-cylinder principle which has produced so many twelves and eights among the larger and more luxurious cars, the development of the year which buyers in that class will find most interesting and important, is the electric transmission which is used in the Owen magnetic car.

This car has achieved considerable distribution in the high priced field in and about New York during the past year and licenses under the patent have been secured by a large maker of electric cars in the middle west, who is shortly to place on the market another luxurious gas-electric of the same general description. It is a principle of construction from which much more is likely to be heard in the class of luxurious cars.

For several years this new transmission principle has been thoroughly tested, both by owners of the cars and by the makers who have made long cross country runs through the mountains with it. In competitive tests with cars equipped with mechanical transmissions it has shown great superiority. On one occasion a large number of writers on automobile subjects were taken for a long tour through New England and New York, in which the remarkable qualities of the car were fully proven.

The car's greatest appeal will doubtless be to the owner-driver of large means—for at present the car cannot be made cheaply. It takes most

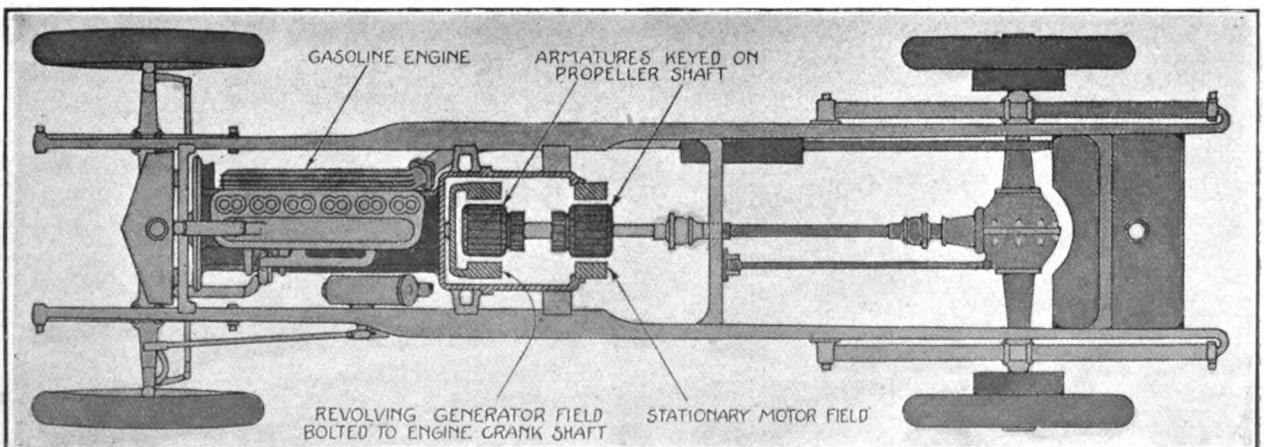
of the difficulty out of driving by abolishing both the gear transmission with its control lever and the clutch. Much of the braking is taken care of also by the electrical transmission, so that the car is in every way as easily handled and as flexible as the ordinary electric coupe, while it has all the speed, power and range of operation of the gasoline car.

Gasoline Motor Supplies Power.

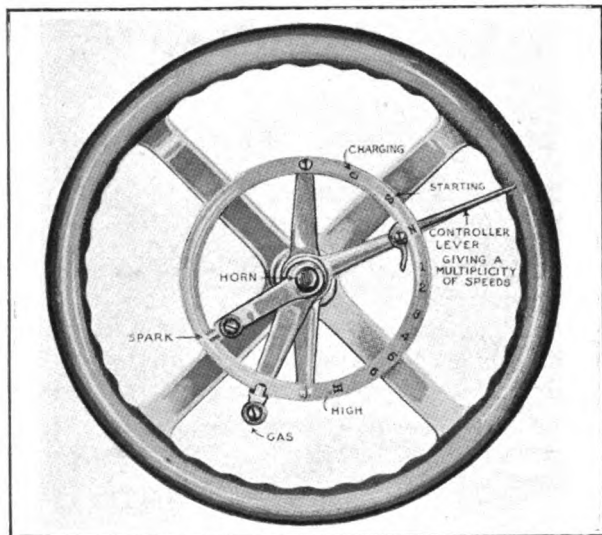
The power by which the car is propelled is created by a six-cylinder gasoline engine of modern and efficient design. It has L head cylinders cast en bloc and $3\frac{3}{4}$ -inch bore by $5\frac{1}{2}$ -inch stroke. The lubrication is the now conventional combination of splash and forced feed. A high-tension magneto is used for ignition. Gasoline is fed by the vacuum system. The electric lighting and starting system is provided by the electric transmission itself and this adds greatly to the simplicity of the construction and eliminates many parts that are necessary on the ordinary gas car.

The electrical system by which these results are accomplished consists of a revolving generator field which is on the end of the engine crankshaft, and an armature keyed on the propeller shaft. Behind this on the propeller shaft is an electric motor, which consists of a stationary motor field and another armature keyed on the propeller shaft.

The first armature tends to revolve with its



Plan View of the Owen Magnetic Chassis Showing Gasoline Motor and Two Electric Units on Propeller Shaft.



Owen Steering Wheel, Showing How Electric Transmission Is Controlled.

generator field through magnetic pull, although there is never any direct mechanical connection between the propeller shaft and the crankshaft. If lower speeds are wanted the armature is allowed to slip in the generator field with an effect exactly like a slipping clutch. But whereas in the mechanical slipping clutch heat is generated and the clutch facing is quickly destroyed the energy which would be turned into heat is here transformed into electricity and is wired back to the second motor, where it is again applied to the propeller shaft, helping to propel the car.

While the electrical apparatus is heavy for its size, it adds little or nothing to the weight of the car because of the amount of apparatus which is standard on the ordinary gasoline car that is replaced. This includes the flywheel, clutch, transmission and the entire electric starting and lighting system, except the wiring, lamps and storage battery.

The electric transmission eliminates all noises that might originate in the transmission and all jerks that come from the clutch. Shocks to the mechanism originating at the wheels cannot be transmitted through this flexible coupling to the motor nor can motor shocks be transmitted to the rear axle. Theoretically the result should tend to much longer life for tires and mechanism than in the standard car, while the reduction in the number of parts, such as

sprockets and pinions, makes mechanical difficulty less likely.

Tests of the car under all sorts of driving conditions have shown that the transmission is efficient. It loses no more energy between the motor and the rear axle than the ordinary car—in fact, somewhat less, with a slight saving in gasoline—than the ordinary car. This car has been driven on comparative tests with the best of the mechanical transmission products through the mountains and over the roughest roads and the efficiency of the transmission and the power of the motor have been found equal to the greatest difficulties.

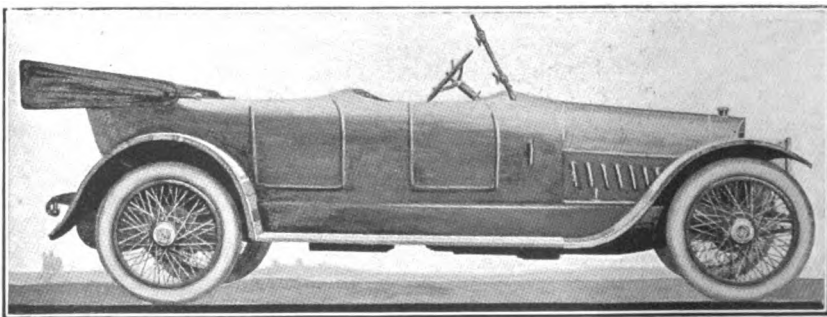
In fact, the construction has so many advantages that it seems assured of a permanent place in the American motor car field, notwithstanding the difficulty which has always been experienced in marketing a product which differed strikingly from the construction most widely accepted by the industry.

The coach work upholstery and finish of the Owen cars is on a standard with the other luxurious cars in the higher priced field. Special body types and special finishes to fit the desires of the individual customers are produced on order.

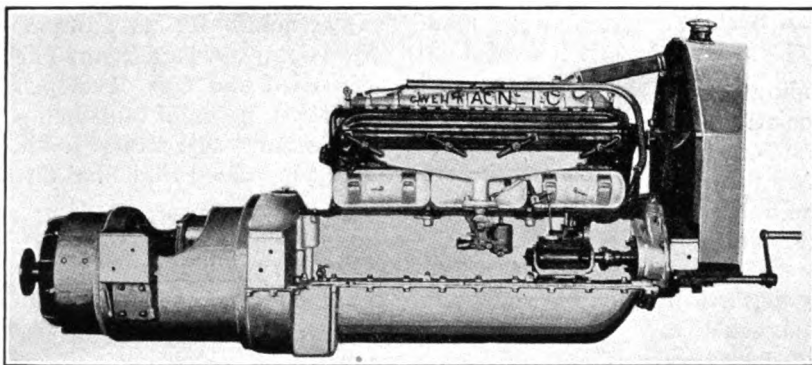
The entire control apparatus for the car is on top of the steering wheel, where it is in easy reach. There is the usual spark lever and the ordinary throttle lever for the control of gas. The electric button which controls the horn is in the centre of the wheel directly above the steering column. The third lever controls all the speeds starts the car and permits it to charge the storage battery when it is standing still, the various positions provide for neutral, six forward speeds and high speed.

Other Features of Chassis.

Some of the other characteristics of the chassis are: I section front axle; steering gear of worm and wheel type; frame alloy steel heat treated; full floating rear axle, taper roller bear-



How the Owen Magnetic Looks Complete.



The Buda Motor Used in the Owen.

ings and helical bevel gears; the front springs are semi-elliptic, 36 by two inches, and the rear springs are semi-elliptic, 60 by 2½ inches. The material is a special alloy steel, which is heat treated. Brakes are of the foot and hand control type and both are internal expanding. The magnetic transmission can also be used for a brake in ordinary running. Wheels are wood with demountable rims or demountable wire wheels are used. The tires on the standard cars are Goodrich 35 by five-inch Silvertown cords or United States. Wheelbase is 136 inches and the tread is the standard 56 inches.

NEGRO CONVICTS WORK UNSHACKLED.

Good roads enthusiasts in the South are much encouraged by reports that unshackled negro convicts were worked successfully on the roads of Tennessee during the past summer. The gang consisted of 55 state prisoners and they were worked on the roads of Williamson county.

Twenty-five of these men acted as trustees and only three of them attempted to escape, although there were never more than five guards present to take care of them. The prisoners were healthy and apparently well satisfied with the work, and residents in the vicinity found nothing objectionable in their presence.

Tennessee convicts have long been employed under the contract system, but public opinion is turning against that practise. Its abolition was urged upon the last session of the legislature by Governor Rye. It was not abolished, but the legislature approved of road work as a better method of employment of prisoners.

The present contracts con-

tain provisions that by act of legislature they can be terminated in six months. James S. Denton, president of the state board of control, thinks that next year contracts will be made with a number of counties for the employment of prisoners for road work.

It was thought doubtful whether negro convicts would have enough sense of responsibility to fit them for the work, but the experiment shows that

they do have and this is likely to mean a great deal to highway improvement in the South.

Along with the great stimulus that convict road work has given to road development, there is a movement growing stronger every day for federal aid in state road building. The next meeting of Congress is likely to see a strong movement for that end.

PARDINGTON FUND GROWS FAST.

A fund for the construction of a section of the Lincoln highway as a memorial to A. R. Pardington, who died after he had accomplished a great deal for the success of the road as secretary of the association, has been established and is growing rapidly.

The funds are being kept entirely separate from the other finances of the organization and will be used only to build this section of road. The amount of pavement to be laid will depend on the amount of funds that are available. It will probably be placed at a bad place in the desert beyond Salt Lake City, in territory where there is the least chance that the sparse local population will be able to build the road.



The Car on One of Its Strenuous Testing Trips.

THE HARTFORD AUTOMOBILE SHOW.

The ninth annual automobile show of the Hartford Automobile Dealers' Association will be held in Hartford, Conn., at the First Regiment armory on Broad street, Feb. 12 to 19. Earlier dates were desired, but these were the first available that would permit a full week's exhibition to be held.

Passenger cars, trucks and accessories will be exhibited. Mayor Lawler will officially open the show and an automobile parade, one of the largest ever held in the city, will advertise the exhibit. Ben F. Smith, who managed the 1915 show, will have full charge of the event, with the assistance of John D. Evans of the Packard company, and Russell P. Taber, the Reo agent. The First Infantry band will furnish the music afternoon and evening throughout the week. Thursday will be society day.

MILITARY CARS AT SALON.

The Automobile salon, as the show of imported cars at the Hotel Astor in New York City during New York show week is called, will be made interesting this year by the display of numerous armored cars and other types developed especially for military service.

France, Italy and England have granted permission to some of their motor car factories for the export of a limited number of their cars in order to maintain foreign trade. Consequently, it has been possible to bring these designs to New York.

The Peugeot is to have at the salon the racing car driven by Dario Resta during the past year.

NO-RIM CUTS DOMINATE FIELD.

Eighty per cent. of all the tires used on American automobiles, with exception of the very small sizes, are no-rim cut tires, or tires conforming to a similar design, according to L. C. Rockhill of the Goodyear Tire and Rubber Company. This design was introduced by the Goodyear company in 1905 and rapidly became very popular.

The old single cylinder cars simply used bicycle tires that were made heavier and stronger than the ones applied to bicycles. It was at that time the only tire that the makers knew how to build. They tried single tubes, which had been popular on bicycles, but it was found that when

they were made heavy enough for an automobile it was almost impossible to repair them. The clincher type was then tried and was developed to a fair degree of perfection, its chief fault being that it was subject to rim cut. The straight side tire with the detachable rim solved that final difficulty.

DOCTORS USE KISSELKARS.

H. S. Daniels, president of the Kissel Motor Car Company, Hartford, Wis., reports that since the advent of the KisselKar all-year model the proportion of professional men to the total of KisselKar owners has advanced from 13 to 18 per cent. The increase is chiefly among practising physicians, to whom continuous motor car operation is essential in either winter or summer and who require comfort and utility as well as style and appearance at all times.

USING POWER FROM DYNAMOMETERS.

Power developed by the 50 or 100 motors that are usually in operation on dynamometer tests in the Reo factory is wired away and turned into the power lines from which the factory machinery is run. This makes the electrical equipment and the gasoline that is burned in testing the cars partly pay their way, in addition to providing the best method that has yet been discovered of testing the power that a motor will develop.

MAXWELL IN OFFICIAL TEST.

An interesting test of a Maxwell touring car is being conducted under the auspices of the American Automobile Association at Los Angeles, Cal. The car has been run continuously and without a motor stop since noon of Nov. 22, covering more than 500 miles daily and showing remarkable efficiency. Official observers ride in the car day and night.

NEW MAGNETO FOR LOCOMOBILES.

The Locomobile Company of America, Bridgeport, Conn., who this season will build only six-cylinder pleasure cars, has adopted the type EMR6 (dual) Eisemann magneto and type DC Eisemann coil to the exclusion of all other makes. The first shipment of Eisemann equipment was made recently.

A REVOLUTIONARY DESIGN FROM IRELAND.

The Fergus Car Made in Belfast and to Be Shown at New York Show, Radically Different from Conventional Design.

A MOTOR car design that is strikingly different from any that has been produced in the United States and yet retains conventional motor and transmission principles, has been designed by J. B. Ferguson, Ltd., of Belfast, Ireland. It is to be exhibited at the New York show.

It is built by a company that before automobiles were generally accepted as of practical commercial value was operating a large machine shop. It had excellent technical equipment and experience.

The company later became the largest distributor of motor cars in Ireland and conducted the largest automobile repair shops in that country. As a result of this experience the firm had exceptional opportunities to observe the details of construction through which the ordinary car most often failed. The new design is an effort to overcome those difficulties.

Original Lubrication System.

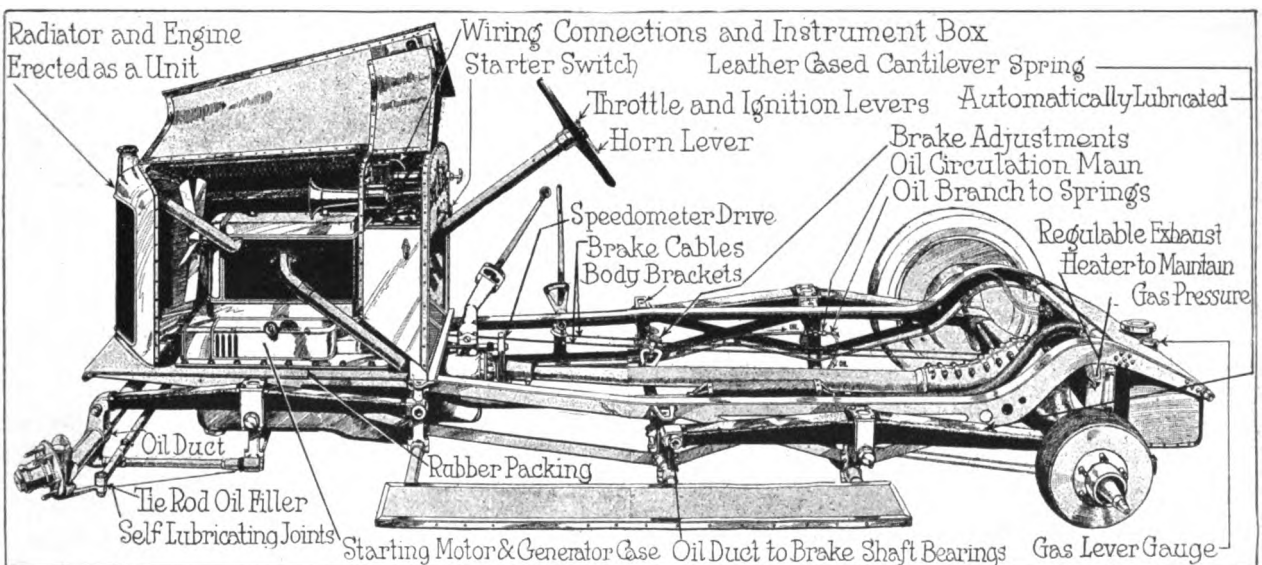
It was observed that the great majority of troubles resulted from some failure of the lubrication system, especially in those cars whose owners also acted as drivers and had no chauffeurs to keep them in the best of operating condi-

tion. Therefore, a strikingly original lubrication system has been conceived, which greatly reduces the labor of keeping the car sufficiently well lubricated.

The average of 81 lubricating points of the ordinary car which need attention at varying intervals of from a few days to a few weeks, have been reduced to 11 in the Fergus design. These 11 points are provided with lubrication reservoirs that need to be filled only once in a long period. In fact, with the exception of attention to the oil level in the crank case, none of these operations needs to be performed oftener than once in six months.

The oiling of these points has been made so simple that the time required for lubrication work during the year is almost negligible. In addition to these remarkable arrangements, the number of parts in the chassis is said to be considerably less than in conventional construction.

Such an oiling system, of course, makes neglect of lubrication much less likely than with standard designs. When about 80 different places have to be oiled more or less frequently—and they are often not easily accessible—many owners will neglect them, whereas if the effort re-



The General Layout of the Fergus Chassis—From the Autocar of London.

quired were less he would keep them in the best of condition.

One of the striking features of the Fergus design is the frame. It is not made of a channel section in the usual way, but is a combination of steel girder and lattice work. It appears not to be very strong on casual inspection. However, it carries very little weight, as most of the load is borne on strong brackets, which are only steadied by the frame, their weight being carried by very strong cross members. These support the load, while the side members serve to keep them in place.

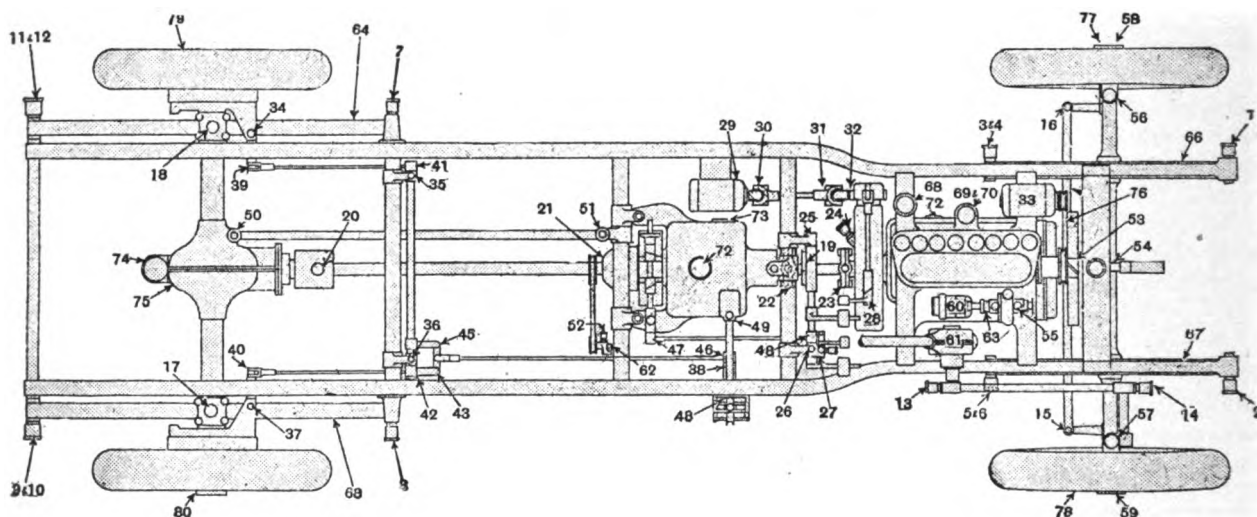
Units Carried on Brackets.

There are four brackets on each side of the chassis and to these are attached practically all the units which usually are bolted to the frame. If a person should jump suddenly on the running

clutch case there is no inspection plate. This was omitted because the clutch is automatically lubricated from the engine, and because the maker did not wish to encourage the owner in making ill-advised clutch adjustments.

The engine is entirely enclosed and has very clean exterior lines. The spark plugs are encased in ventilating covers, through which only the plug cut out buttons protrude. The only other equipment that projects from the smooth side of the case are the carburetor and the oil filler. There is a recess on the opposite side of the engine, where the electric starting and lighting units are housed, the Fergus, unlike many European cars, being provided with this equipment.

The housing which contains the electrical units has louvres in the sides so that air drawn



Layout of a Typical Old Style Chassis, Showing More Than 80 Points to Lubricate.

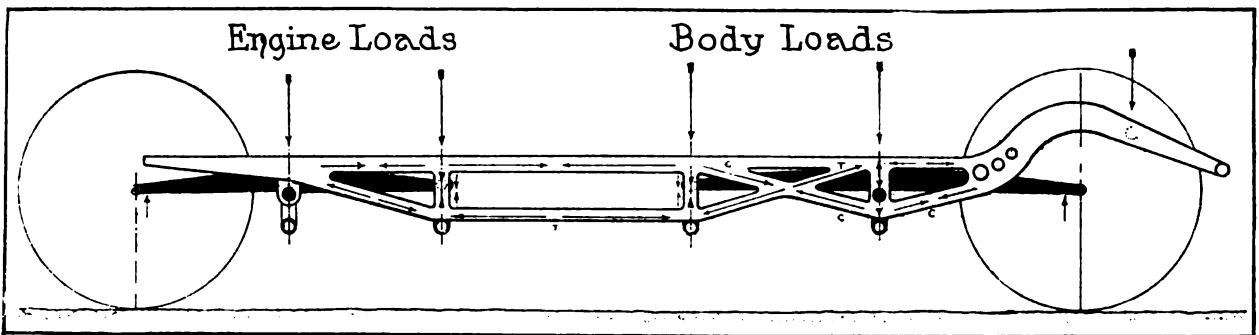
board there would be no flexion of the frame, as in the ordinary chassis, because the strain is taken by the cross members. The body is mounted at four points on the extensions of the brackets, which carry, respectively, the centre and one end of the cantilever spring, so that the weight of the body is carried also by the cross instead of the side members of the frame.

The engine has four cylinders cast en bloc and rests on rubber strips on top of the wide upper flanges of the frame side. This makes a weather proof joint between the engine and the frame. It absorbs torque vibration originating in the engine and prevents its being communicated to the entire car. The engine, clutch, flywheel and transmission are in unit; the lower half of the crank case, flywheel housing and transmission case are all one casting. In the cover of the

in by the carburetor passes over and cools the dynamo on its passage to the carburetor. The starting motor drives through teeth on the periphery of the flywheel in the conventional American manner.

The cooling system is a thermo-syphon type. The inlet and outlet are at diagonally opposite corners of the radiator, which is mounted on brackets off the crank case. One of these brackets is hollow and water flows through it to the cooling chambers about the cylinder. This manner of mounting entirely insulates the radiator from stresses, due to weaving of the frame.

In proportion to the size of the cylinder bore the engine is remarkably short. Instead of having the usual cooling jacket between the first and second and third and fourth cylinders, where there is no bearing, there is between each pair of



Drawing Showing the Light Lattice Work Frame of the Fergus.

cylinders a passage to allow the water to pass.

Provision for drilling these water passages is made by there being holes $4\frac{1}{2}$ inches in diameter cored on the sides of the cylinder casting when it is cast, and these are used for the insertion of the drill. The openings are later filled by blanks which are bolted and rusted in place.

The design employs an overhead camshaft with overhead valves. The fan is mounted on the top of the cylinders at the end of the shaft and acts in a measure as a flywheel for that shaft.

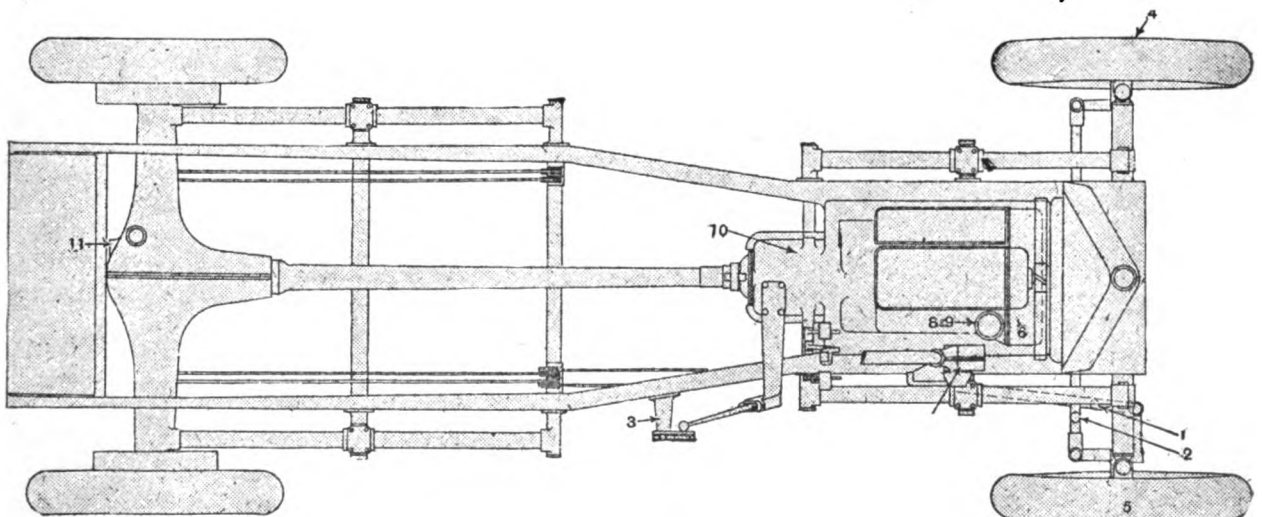
A special tool for decarbonizing the cylinder head is provided with each chassis. It is a scraper made to the proper angle to be inserted through the inlet valve orifice to dig the carbon out of the cylinder.

The oiling system design incorporates a gear pump, which is driven off the shaft that conveys power from the crankshaft to the camshaft. The oil passes through a filter under the oil filler and is then driven at a pressure of about 20 pounds to the centre crankshaft bearing, and from there it passes in either direction through the hollow shaft itself.

The cylinder walls are lubricated by oil that flows from the end bearings on to the cranks and is thrown upward. Deflector guards are arranged so that the amount of this oil can be controlled. A large proportion of the oil delivered by the pump is by-passed through a hole in the cylinders to the camshaft housing, where the shaft itself runs in a bath of oil. From here the oil lubricates the gears that drive the camshaft and runs down the drive shaft to the gears by which the shaft is driven off the crankshaft. The valve rockers are lubricated by the mist in the camshaft housing.

In addition to the regular supply of oil, an extra gallon can be carried in an auxiliary tank. This tank is connected with the sump by a valve by which more oil can be admitted to the crank case, so that it is unnecessary to pour oil through the filler to raise the level in that component. The result is obtained simply by opening the valve.

This pressure system is continued to the clutch bearings and the transmission system, making the lubrication of those parts automatic also. The automatic lubrication system has been



Lay Out of Fergus Chassis, Which Cuts Lubrication Points to Eleven.

adapted to the entire chassis, except to the rear axle and the steering gear.

Both the front and rear springs are of the cantilever type, and the oil passes to the pins in the centre of each spring. The oil passes from that point through a hole in the centre of the spring and through small grooves on each leaf. To prevent rusting and to exclude dirt, each spring is enclosed in a leather casing, which also is used to cover the slides at either end of the springs.

The hole through which the oil passes into the spring is closed by the weight of the body when the car is not in operation, so that the amount of oil fed to each spring is in direct proportion to the amount of work each performs.

The steering gear is not lubricated from the engine, but it has a reservoir that holds enough oil to serve for six months of service. All of the parts that go to make up the system are simple and cheap to make and it should be possible to use them in construction of American cars at moderate prices.

STEWART AUTOMOBILE SCHOOL.

The largest automobile school in the United States is believed to be the Stewart Automobile School, at 225 West 57th street, New York City. Business has been so brisk of late months in this institution that more space has been acquired and new equipment added. A visit to the school is a revelation in the matter of the quantity and variety of equipment considered necessary for instruction purposes. There are motors of the latest designs, including eight and 12-cylinder types; a large variety of electric starting and lighting systems and a number of other interesting motor car equipment and components.

AUTO TOURISTS ENTERING CANADA.

Motor car tourists from the United States now have permission to enter the Dominion of Canada without the necessity of supplying a bond, as was the requirement in the past. The only formality now required is to sign a certificate bearing a description of the car and the home address of the tourist, after which the tourist may stay in the Dominion for 10 days. This arrangement was brought about largely through the influence of the Board of Trade of Sherbrooke, Que., which was supported in its agitation by the Eastern Townships Associated Board of Trade.

APPROVES CONVICT ROAD WORK.

The idea that organized labor is opposed to the use of convicts on the roads is denied by John J. Manning, a representative of the United Garment Workers of America. He takes the position that the test of the value of any plan of convict labor is its effect on the health and condition of the prisoners. With regard to road work he says:

"Most of the men in our penal institutions come from an environment that has been detrimental to their development. Removing them from the prison environment and giving them a chance for development along lines which they have been denied is bound to have a beneficial effect upon them and incidentally on society at large."

He said that organized labor had complained of the use of convicts on the roads in times of depression, when there were thousands of free men out of work who needed the employment. He said also that road work near large cities where there was always available large numbers of unemployed free men, was objected to by organized labor, but that it had no objection to their use in country districts.

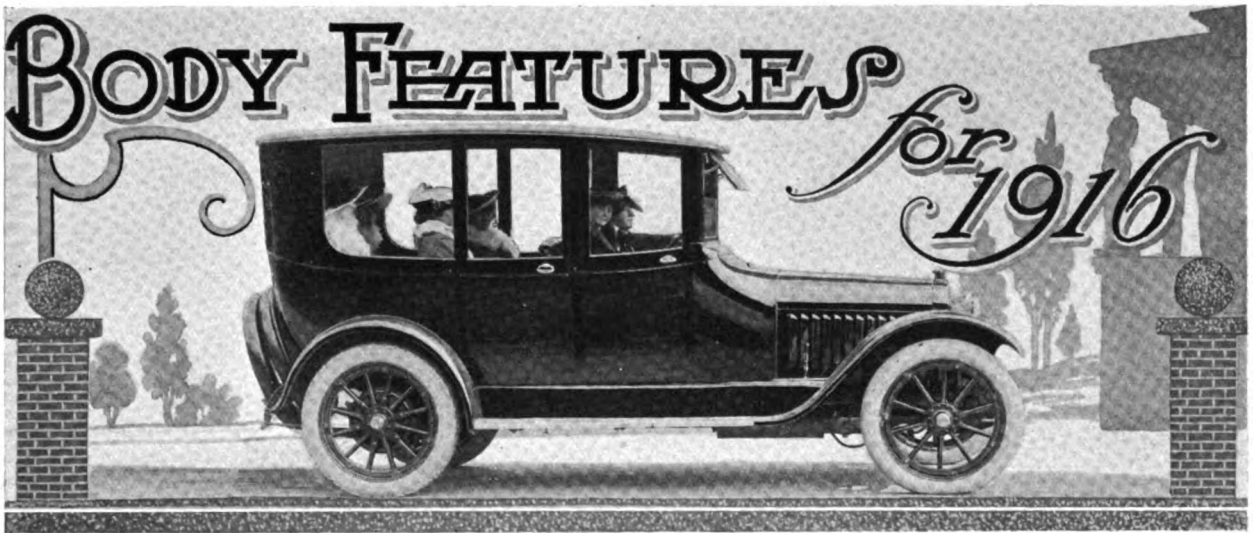
Some working men felt, he said, that if convicts were used on the roads the work would soon be all done and that kind of work would be removed as a possible source of employment for free men for all time, but that in view of the enormous amount of highway construction and maintenance to be done such a view is foolish.

JITNEYS TOOK THE PROFITS.

Evidence submitted by a British Columbia electric company to arbitration committees dealing with rates in the suburban communities about Vancouver, indicated that the development of the jitney had reduced the company from a prosperous concern paying dividends to one that could not pay the interest on its bonds.

The capital of the company was shown to have increased from \$7,000,000 in 1906 to \$9,000,000 in 1908, and to \$46,000,000 in 1914. This included gas, light and traction enterprises, and represented actual cash subscribed by shareholders and bondholders.

The biggest dividend was in 1908, when the company earned 7.82 per cent. on its stock. In 1913-14 it earned 4.69 per cent. and last year 2.76. The company claims that it is not earning enough now to pay interest and that more passengers are carried in the city by jitneys than by trolley cars.



AMONG the innovations in body designs shown this season, one of the most important and popular is the convertible or detachable closed body. It has received a great deal of attention from the public and the car makers report extraordinary sales since the beginning of winter. It has made the closed car for winter use very popular and will keep many more cars in service this winter than were used previously.

The divided front seat type with the aisleway between, which affords passage from the front to the rear compartment, has many more adherents this season than ever before. In both open and closed seven-passenger car models, auxiliary seats that can be folded either into the floor or the front of the back seat are becoming more generally used.

Another development that is meeting with increasing popularity is the double cowl, a design in which the usual projection of the front seats above the parapet is avoided. Radiators have generally been made higher and narrower, and the boat line type of body design has become very general.

Well Finished Detachables.

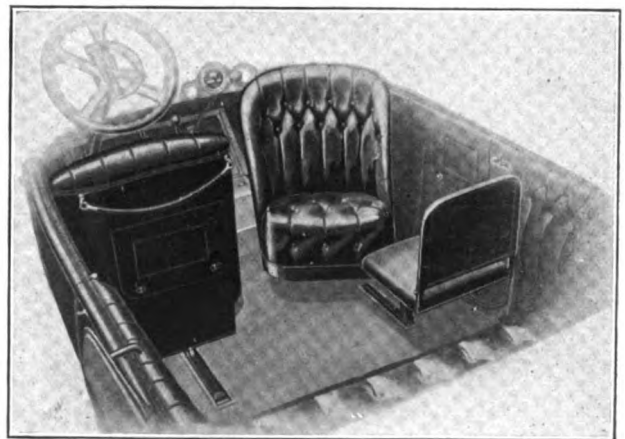
Detachable tops have been worked out with a grace and finish of workmanship that compares favorably with the permanent tops of former seasons. They can be attached in a few minutes by removing the summer top and by bolting them onto the permanent open body.

At some of the fall motor car shows held in connection with state fairs, the fact was developed that the public liked this new arrangement, and immediately a great number of makers either began the production of detachable tops or made an arrangement with makers of bodies and tops

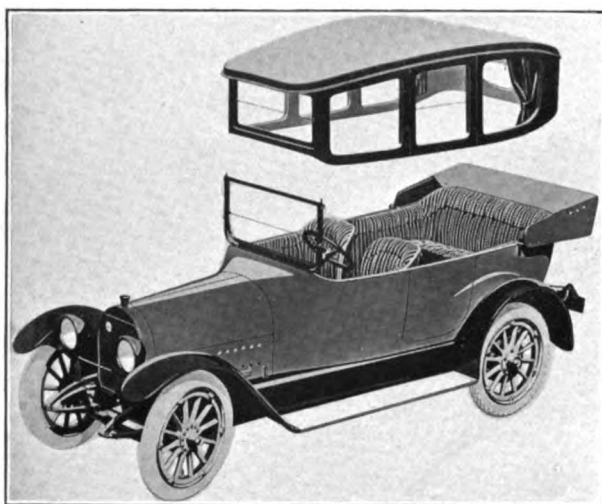
whereby their dealers could be supplied.

Now nearly every car maker in the moderate priced class, and some whose prices are not so low, have offered tops of this type. In some cases, notably that of the King Motor Car Company, they have adopted a detachable body, ironed their touring bodies so that it will fit, and arranged to have their dealers do business directly with the manufacturers. This enables the dealer to get a very low price on a car top and by cutting the final price to the public to increase the volume of sales.

The top adopted by the King company is one made by the Rex Buggy Company of Connersville, Ind. It was designed to fit the King models and the company fitted a number of cars with it to be used as demonstrators. Bodies to be used on customers' cars will be bought by the dealers from the body makers direct.



A Swiveled Front Seat in the Apperson Three-Door Touring Car.



KisselKar Two-Door Touring Shown with Detachable Top Which Fits It.

In fastening on the King detachable body the regular top irons are taken out and four others are put in their places. These provide four vertical studs on which the winter top is set down and made fast by nuts. This secures the rear of the top very firmly. The front is fastened rigidly to the upper ends of the windshield irons.

The main frame of the body is hard wood and is well strengthened at the joints. It has a leather and Pantasote roof. A supporting post is located on each side of the tonneau just back of the tonneau doors. When the side protection is removed the body is just as open as one with the standard summer top.

The rear-most windows are held in frames that can easily be put in place and held by screws. To attach the windows in the doors a few screws are run vertically into sockets on the top edges of the doors. The parts to which the windows are hinged are attached to the roof frame.

An ingenious constructional detail is the use of thin pressed metal troughs, which connect the bottom edge of each window piece with the top edge of each door. As the windows and doors swing on different hinges a gap opens up between the two, and in other designs there is danger of pinching the finger when they are closed. The metal trough construction eliminates this danger and also aids in keeping out the driving rain.

All around the lower part of the body is a leather flap, which covers the junction between the two sections. The top rests on felt pads, so there is no danger of marring the paint of the regular touring body. The inside finish is in cloth or Bedford cord. The tonneau windows are divided and the lower halves may be easily lowered to provide ventilation. There is no part of the assembly that will rattle. The King company has arranged to have its dealers supplied with these tops at special prices.

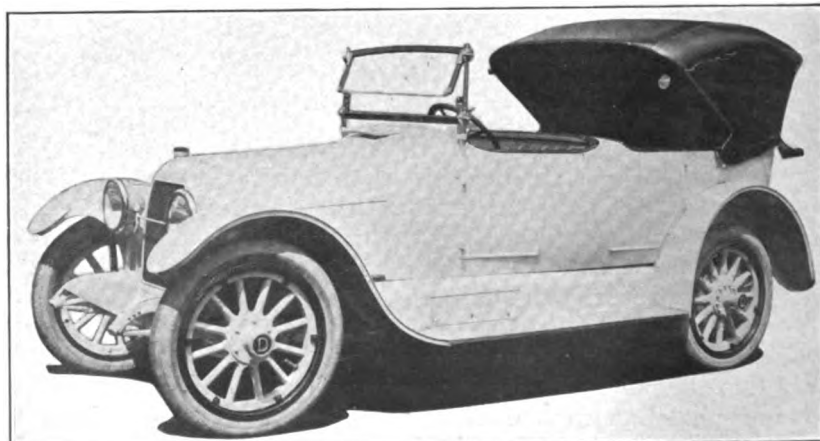
The KisselKar Body.

Typical of the better grade of these new bodies is that offered with the various types of KisselKars. The tops are secured to the touring car bodies by bolting at 10 points. In six places they are made fast to heavy steel brackets and at four points to top irons provided for the regular top. An inverted top iron is used, so that when the top is in position there is no indication of the dividing line between the superstructure and the regular body.

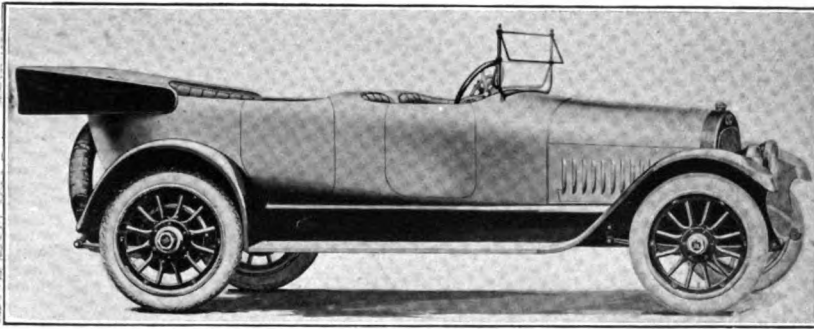
KisselKar frames for winter tops are of heavy white ash and elm and have mahogany sashes. They are covered with sheet steel and aluminum. The roofs are of three-ply white wood, covered with canvas. Material and construction make warping practically impossible.

Windows and door lights are of French plate glass. The interiors are lighted by electric dome lights. Leather is used for interior trimming material. The bodies are very carefully painted and finished on the outside. Seventeen coats are applied and each body is subjected to several finishing operations. The hinges are of pressed steel and the locks and window fixtures are of brass.

The top is made in coupe and sedan types. In addition to these tops, the Kissel company con-



The New Daniels Eight—A Double Cowl Design.



The New Cole Eight Body with Divided Second Cowl.

continues to produce the conventional enclosed body types of former years. There are in all 15 Kissel body styles now offered, several of which will be seen at the shows.

The Chalmers Palanquin.

The detachable body supplied for the new Chalmers Six-Forty has been styled the Palanquin. It is much lighter than the regular limousine body and consequently does not increase the cost of upkeep and does not require the use of tires of any greater size than a touring car. To eliminate any hint of makeshift appearance, the Chalmers engineers are said to have first designed an enclosed car, and then separated the top from the bottom in such a way as to leave the lines of the standard touring car for lower part of the body. This design gives almost perfect junction of the detachable and the permanent parts of the body.

Seven adult passengers can be carried in the interior of the car without crowding, even though heavy wraps are worn. The doors are unusually wide and swing out of the way to allow easy entrance and exit. Both front seats are completely enclosed.

Windows of ample width provide unobstructed views on all sides. The windows in the rear and front doors can be raised and lowered. Great care has been taken to make the joint between the two bodies wind and water tight.

The Victoria cabriolet is another new Chalmers enclosed body to be mounted on the same chassis. Three full grown people can be seated comfortably. In warm weather the top may be lowered to convert the car into a substantial roadster. The upholstery is full long grain

leather and is exceptionally deep and soft. The top and sides are lined with rich gray imported cloth and has trimmings to match. Seat covers in several patterns of materials to harmonize with the upholstery can be secured. Double oval windows in the back and large windows in the doors give a free view on all sides. This feature is especially appreciated when the

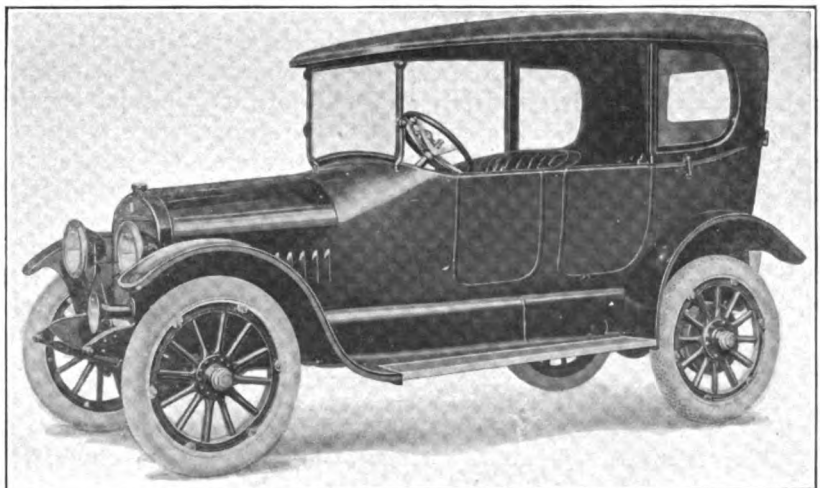
car is being driven backwards or when being operated in traffic.

The Saxon company is offering detachable bodies for both the small four-cylinder roadster and the six-cylinder touring car. For the roadster model the price of the body is \$60. The top for the touring car costs \$150. The superstructure is finished in harmony with the rest of the body as regards both the interior and the exterior. The tops bolt down firmly and easily.

The Overland Equipment.

Model 83 Overland, which sells for \$750 as a touring car, is provided with a limousine detachable top for \$200 extra. This has four wide limousine doors which open and close easily. The windows are large, so that a light and pleasant interior is produced. Lighting at night is accomplished by a dome light held in a nicked frame. It is controlled by a button on the right arm of the seat.

The interior is trimmed with rich gray cloth, which is in harmony with the body upholstery. Dainty silk draperies are hung at the rear side windows, and there is a roll up curtain at the



Detachable Sedan Top with Removable Sides Used on King Eight.

back window. The top was designed with the car, so that the lines of the two blend perfectly.

All three models of the Regal line are equipped with detachable bodies, which take the place of the standard tops and are so securely locked to the touring bodies that all rattle is eliminated. The bodies are weather proof and electrically lighted.

A type of winter body that differs from the foregoing models is furnished on the Maxwell chassis. It is a permanent top body, the sides of which may be removed in the winter time, which then give the effect of a "canopy" top. The glass sides are lowered by slides down into the body. A six-passenger town model and a two-passenger cabriolet are fitted with this type of body.

Nearly every variety of permanent or detachable closed bodies may be had for the Ford car. They are not made or sold by the Ford company—except the regular town car body—but are pro-

formerly cost from \$400 to \$700 each.

The new top is fastened rigidly to the touring car body. It is attractively lined with whip cord. A large electric light concealed in the top of the car furnishes an abundance of light. The windshield is of a built in type and has ventilating features. Doors open the full length. The side windows can be taken out, making practically an open touring car for moderate weather.

Exceptional care has been devoted by the Jackson Automobile Company to the design of special sedan tops for its models 34 and 348. They have plate glass windows that can be lowered for ventilation, an electric dome light and heavily nickeled fittings. They are lined with an attractive shade of gray whip cord.

They are fitted on the bodies over the regular top irons without any alterations, and though substantially built are comparatively light in weight.

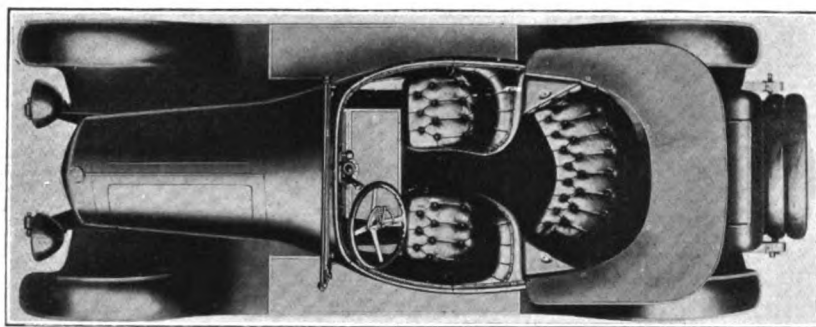
A detachable sedan or limousine top is furnished for the Jeffery Four. The material is of the same grade as that of the lower part of the body, and the two sections are practically indistinguishable. The contour of the top harmonizes with the body.

The roof of the top is of laminated wood construction and is covered with a fine quality of top material. The rear section is metal and the supports and sills are of a very substantial

character, and yet the top does not weigh 200 pounds. The removal of the regular summer top reduces the total by 100 pounds, which means that the addition of the winter top only increases total of the car weight by 100 pounds.

The glass in the windows is 3/16-inch ground and polished crystal plate. In the two broad forward windows and in the windows of the doors the glass is arranged to be dropped half way. The rear window is of exceptionally ample size. This window and the two at the sides are provided with silk portiere curtains.

The New Cole Eight, which is shown at the national displays this year for the first time, is a double cowl type of touring car of almost pure streamline effect. The front part of the body is sloped up to the first cowl in such a way that there is almost no projection above the bonnet. The cowl over the back of the front seat is also very low. This design is unusual in that it combines the double cowl with the divided front seat



Apperson Four-Passenger Roadster—There Are Several Like This.

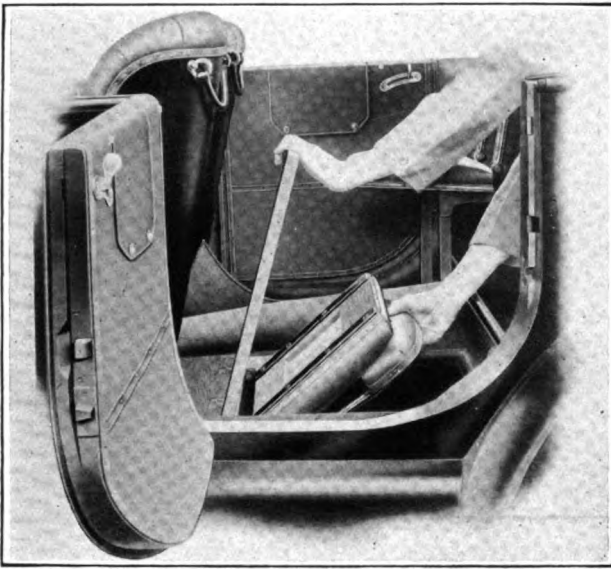
duced by many body building firms. One of these is the "All Season" limousine top, which is built and sold by the Wadsworth Manufacturing Company of Detroit.

This top fits flush with the body and does not overhang, which makes for very neat appearance. It is fastened very firmly and will not rattle or creak. The interior material is the same as that used in trimming the car. It is entirely finished in imitation leather.

The glass doors and panels are easily removable and curtains can be fitted in their places for summer use. Especial care has been given to fitting the top to the windshield. The shield can be opened or closed at will, but when it is closed it is impossible for rain or snow, dust or wind to reach the interior.

The Mitchell Detachable.

The "Mitchell "Six of '16" is equipped, at an extra cost of \$165, with a detachable sedan top, which serves as well as the closed bodies that



How Auxiliary Seats Fold Into the Floor.

--a feature of such utility and convenience that it has been adopted on a very large number of models.

Because of the utility afforded by divided front seats, some makers have reduced the number of doors. Some have abolished the fore doors entirely, leaving two opening into the rear compartment. There also are three door models, and a few turned out by the special body makers have only one entrance.

Another feature of the year is the four-passenger roadster. Despite its large carrying capacity, this type does not differ widely in appearance from the conventional two-passenger type.

Space is provided for four passengers by mounting two small divided seats in front, which is an arrangement quite similar to the divided seat design of the touring car. The aisleway leads to a wider seat across the back, which will accommodate two more passengers.

Some of the divided front seats are arranged on swivels so that they can be turned in any direction. Thus the driver's companion may look ahead in the usual way, or he may turn his chair about for intimate conversation with the people on the rear seat. This feature has many advantages in both open and closed cars.

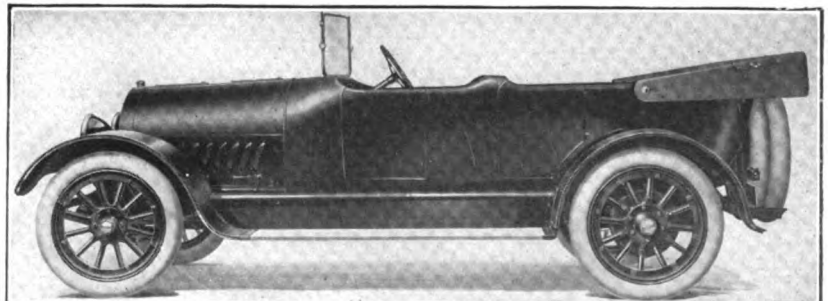
There is a strong tendency among makers of moderate priced cars to not use leather as an upholstering material.

Cloth, or one of the numerous leather substitutes, has been adapted instead. Leather has been increasing rapidly in price for many years, and consequently the best grade that most of the makers of the lower priced cars have been able to afford has never been better than an inferior type of split leather.

The effect of the tremendous demand for harness and other leather products by the warring nations has been to make the leather even more scarce and to increase the price. There is a strong prejudice on the part of most buyers in favor of leather upholstery, and the experts admit that there is no better material than the finest grade of leather. But specially woven and exceptionally strong cloths, and such products as fabrikoid, which consists of a special cloth treated with a leather dressing compound and embossed like leather, are much more durable than low-grade leather. Some of the substitutes are so much like the genuine article that few people can tell them apart. They have much better wearing qualities than split leather.

Thus, at the beginning of the season, the Overland cars were upholstered with special cloth instead of leather, and toward the end of the year fabrikoid was adopted as standard for Overland upholstery. As the situation regarding upholstering materials comes to be more fully understood by the public, and the prejudice against leather substitutes disappears, there is certain to be a large increase in their use for all but the most expensive cars.

A proposition to build a modern road to Long Beach, Long Island, N. Y., having been defeated at the last election, H. C. Pritchard has made a proposition to the town board of Hempstead that he will build a 100-foot wide toll road through the intervening swamps, to be divided into three sections and to cost \$500,000. In return he asks a 99-year lease and the privilege of collecting tolls.



McFarlan Double Cowl Touring Car.

INDUSTRIAL HAPPENINGS AND COMMENT.

THE Beaver Manufacturing Company, Milwaukee, Wis., is said to have received an order to build 3500 special motors for the new Sun six-cylinder light model that is expected to be put on the market about Jan. 1 by the Sun Motor Car Company. In speaking of this order, R. C. Hoffman, designer of the motor and engineer of the Sun Company, called the Beaver company one of the strongest motor builders, financially considered, in the country. The company is exceedingly well equipped to handle the machine work. A large testing laboratory, where the motors will be run in by belt and then tested individually, has been installed.

The Haynes Automobile Company, Kokomo, Ind., recently completed a two-story glazed brick office building directly opposite the factory plant. Moving operations began on a Saturday evening and continued through Sunday. At the beginning of the working day on Monday all office equipment had been transferred and the office force was able to immediately begin routine duties without losing a moment of working time. The dispatch with which the removal was accomplished is characteristic of all Haynes operations. The new office building is

than are masculine workers. The company's officials take pride in the manner in which they are taken care of. Large, airy rooms are naturally and excellently lighted from three sides and are well heated during winter months. During the noon hour and at recreational periods the women have permission to use spacious rest rooms, which are equipped with easy chairs and couches and adorned with plants. A matron supervises the rooms, visits sick workers in their homes at night and selects suitable living quarters for the girls.

C. Louis Allen, sales manager of the Pyrene Manufacturing Company, New York City, has been holding sales conferences in various parts of the country. His itinerary includes Atlanta, New Orleans, Dallas, St. Paul, Chicago and Pittsburg and several other western cities. At Kansas City he was one of the prominent speakers at the National Rotary Club.

The Bosch Magneto Company has erected a large building comprising 60,000 additional square feet of floor space at its Springfield, Mass., plant, where all Bosch magnetos sold in the United States have been manufactured since 1912. The addition, which will soon be ready



Corner of the Curtain Department of the Chalmers Company, Where Women Are the Most Expert Workers; View of a Section of the Exceedingly Well Equipped Recreation Rooms for Feminine Workers at Chalmers.

thoroughly modern in every respect and cost more than \$20,000. The interior walls are of glazed brick, while the wood trimmings are of oak. What is characterized as the largest dictaphone system in Indiana has been installed. All department heads and officials have private offices, which adjoin the general offices. Two attractive features of the layout consist of a large reception hall and a spacious and well equipped garage at the rear. Lighting is by an indirect system.

The Spiltdorf Electrical Company, Newark, N. J., recently secured an equipment contract from the Continental Motors Manufacturing Company of Detroit for Dixie-40 magnetos, cables and switches. The contract is significant as an example of the great advance made by the Dixie magneto models in general practise. This order means that all Continental motors used for show purposes or submitted to manufacturers as samples will be equipped with Dixie systems and so filled on orders, unless working specifications call for other ignition.

The Studebaker Corporation has been consistently producing each month more cars than in the preceding month. Present indications are that the 1916 production will far exceed the number originally planned. The day's production record stood at 347 cars for more than a month. Nov. 27 there were 356 cars turned out.

The Chalmers Motor Company, Detroit, employs about 200 women and girls, mainly in the small parts assembly and the side curtain departments, where they are found to be much more expert in those lines of work

for occupancy, will make the Bosch plant the largest magneto producing unit in the world.

The Chevrolet Motor Company is reported as now producing cars at the rate of approximately 185 a day. The production schedule calls for an output of 210 cars a day in January, 1916, and it is confidently expected by the management that by June the company will be turning out and selling a daily total of 350 cars.

C. Percy Anderson, connected with the Joseph Maw & Co., Winnipeg, Canada, Chalmers dealer, is reported as saying that the "Chalmers, Reo and Hupmobile companies are heeding the call of the Canadian market and will have factories operating in Canada within a very short time." He avers that all the large car builders in the United States will be compelled by the unsatisfactory results from handling cars across the border to erect plants within the Dominion very soon.

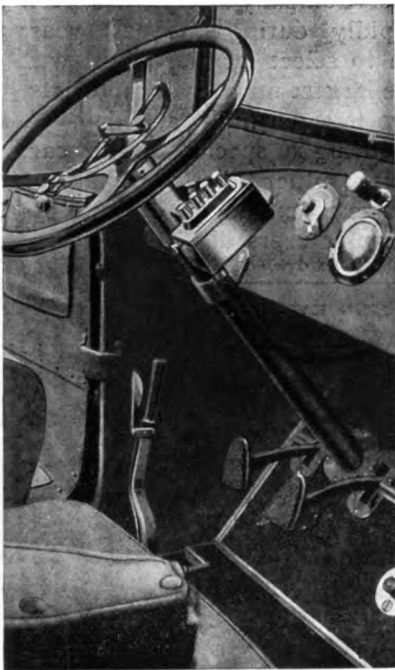
The Inter-State Motor Company, Muncie, Ind., has experienced such a large demand for its cars that it has been compelled to increase its equipment and floor space. A large addition is now under way, the building measuring 80 by 150 feet and providing approximately 36,000 square feet. The company is laying plans for a production of 6000 cars during 1916, which is a rate of 40 a day. Based on a 10-hour day, this means an output of a finished Inter-State machine every 15 minutes.

The Toledo Automobile Specialty Company, Toledo, O., is to manufacture a limousine body for Overland cars like the unit the company has been making for Ford cars.

THE CUTLER-HAMMER GEAR SHIFT.

A New and Interesting Application of Electricity to Produce Greater Comfort and Efficiency in Motoring.

THE application of electricity to the automobile to increase the comfort and convenience of the motorist is becoming more general each year. With each successive step motor car designers take a step nearer to the perfect vehicle.



Operating Push Buttons of C-H Magnetic Gear Shift Are Mounted Under Steering Wheel.

First the electric spark replaced the hot tube ignition of the early engines; then electric lights were used to replace troublesome acetylene and oil systems; then the labor was taken out of cranking by the electric starter and it became possible for a woman to operate a car alone without difficulty.

Now the electric brake is offered to make muscular strength unnecessary in stopping the car. The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has designed and is offering a magnetic gear shift by which the speeds of a gasoline car are changed by the mere pressure of a button. This system removes from bad and hilly roads their worst terrors for women drivers and those of small masculine operators not possessing much physical strength.

Positive Magnetic Action.

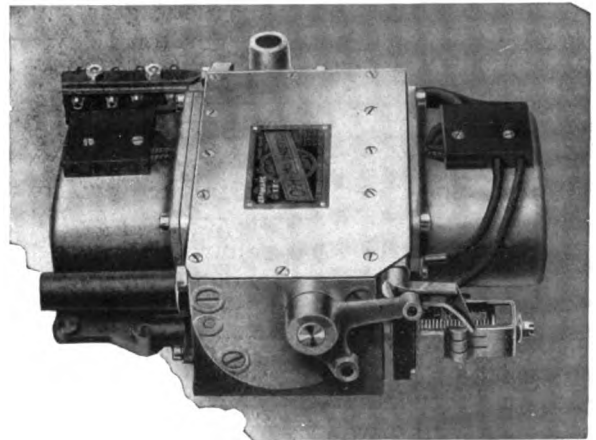
This magnetic gear shift is based on one of the most simple and most widely used electrical principles—that of electro-magnetism in which solenoids are used. The solenoid is similar in many respects to the horse shoe magnet with which children pick up needles and other steel

objects. While the energy of the magnet is permanent and does not vary, the solenoid exerts its power only when electric current is passing through its coil. And this current can be controlled at will.

A simple solenoid can be made easily by any one who is interested in the action of this device. Wind about six yards of cotton covered copper wire on a spool in much as the thread originally on the spool was wound. Cover the wire with a piece of cloth and strip off the wire's insulation for about an inch at either end.

Attach one end of the wire to a dry cell terminal. Place a nail part way in the spool opening and touch the other end of the wire to the remaining battery terminal. The current will cause the nail to move into the spool until it is at the exact centre. This is a principle of electro-magnetism that is absolutely positive.

In a similar way the Cutler-Hammer gear shift is constructed. Four solenoids are used in the system, one for each of the gears with which the ordinary three-speed forward sliding gear transmission is equipped. These are arranged in two sets of two each and the method of their



The Gear Shifting Mechanism of the C-H Magnetic Gear Is Mounted on Top of Transmission Case.

operation can be traced in the accompanying diagram. Steel shafts, whose duty it is to move the gears, are placed inside of the solenoids and as

the current is turned in to one or the other of them the shafts are moved back and forth by magnetic attraction.

The solenoids are connected with the buttons on the control board, which is in easy reach of the driver. There is a button numbered to correspond with each solenoid and when it is pushed the gears are moved in one direction or the other. It does not move at once, however, as the circuit is only partially closed. The actual shift occurs when the clutch pedal is depressed.

Selects Gears in Advance.

By this means it is possible to select the gear into which the driver wishes to go some time in advance and then make the change in an instant by merely letting the clutch out and putting it back in again.

The position of the driver is always the same—erect behind the steering column, with both hands on the steering wheel. He can keep his eyes constantly on the road ahead. The change of gears is made noiselessly and is always positive because the pull of the magnets on the gears is much stronger than any that a driver could exert with his full strength. Even a novice cannot make a mistake that will strip the gears, because the clutch is always out before the shift can take place.

It requires less current to operate the gear shift than it does to produce a blast of an electric horn. A socket is provided in the mechanism for the usual hand shifting lever and it can be used if the battery is exhausted or anything happens to the electrical system.

This description also applies, in practically every detail, to the Vulcan magnetic gear shift, which is standard equipment now on Haynes cars.

TO INVESTIGATE INSURANCE.

Hearings have been held before the New York state superintendent of insurance, Jesse A. Phillips, on many charges that automobile insurance was written in New York City on the much lower rates than had been established for suburban communities, which is contrary to the anti-discrimination law.

It was found that one company had many such policies, all of which had been written by a certain brokerage company. The statement of the insured as to the nature of the risk was accepted by the broker and the company took the broker's word. Both company and broker were asked to show cause why they should not be disciplined.

They held that the practise was common with all companies writing automobile insurance in New York. They were ordered to investigate the facts and correct the policies either by cancellation or rewriting. Action is to be taken against other companies if they continue the practise.

ESTABLISH MANY SERVICE STATIONS.

Service stations for Miller tires are being rapidly established in every city where that make is represented by a dealer or a branch. This part of the Miller Rubber Company's work has been expanded very rapidly during the past year. Great care is taken to select locations that will be convenient to the largest number of motorists, and the stations are manned night and day. A telephone call will bring a special service car, which is able to replace either tubes or casings at any time. The service is extended to all motorists equally with regular users of Miller tires.

COMING EVENTS.

January.

- Jan. 1—Show, Springfield, Mo.
- Jan. 1- 8—Show, New York City.
- Jan. 3- 9—Importers' salon, New York City.
- Jan. 5- 6—Meeting, Standards Committee, S. A. E., New York City.
- Jan. 7-11—Convention, National Association of Automobile Accessory Jobbers, New York City.
- Jan. 7-13—Show, Milwaukee, Wis.
- Jan. 8-15—Show, Cleveland.
- Jan. 8-15—Show, Philadelphia.
- Jan. 10-15—Show, New Bedford, Mass.
- Jan. 10-15—Show, Fort Wayne, Ind.
- Jan. 10-Feb. 1—Show, Jacksonville, Fla.
- Jan. 14-22—Show, Dayton, O.
- Jan. 15-22—Show, Detroit.
- Jan. 17—Show, Wilmington, Del.
- Jan. 17-22—Show, Rochester, N. Y.
- Jan. 18-22—Show, Baltimore.
- Jan. 22-29—Show, Chicago.
- Jan. 22-29—Show, Montreal, Que.
- Jan. 23-30—Show, Portland, Ore.
- Jan. 24-29—Show, Buffalo.
- Jan. 25-29—Show, Lancaster, Penn.
- Jan. 29-Feb. 5—Show, Columbus, O.
- Jan. 29-Feb. 5—Show, Minneapolis.

February.

- Feb. 7-12—Show, Kansas City, Mo.
- Feb. 9-12—Show, Peoria, Ill.
- Feb. 12-19—Show, Hartford, Conn.
- Feb. 14-19—Show, Des Moines, Ia.
- Feb. 19—Show, Newark, N. J.
- Feb. 20-27—Show, Grand Rapids, Mich.
- Feb. 21-26—Show, Bridgeport, Conn.
- Feb. 21-26—Show, Louisville, Ky.
- Feb. 21-26—Show, Omaha, Neb.
- Feb. 21-26—Show, Portland, Me.
- Feb. 21-26—Show, South Bethlehem, Penn.
- Feb. 21-26—Show, Syracuse, N. Y.
- Feb. 28-March 4—Show, Paterson, N. J.
- Feb. 29-March 4—Show, Fort Dodge, Ia.
- Feb. 29-March 4—Show, Sioux City, Ia.

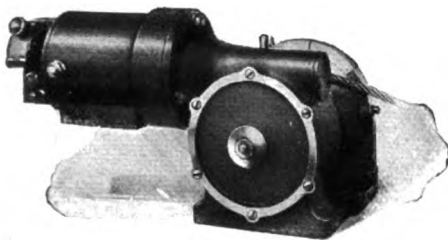
March.

- March 4-11—Show, Boston.
- March 6-11—Show, Utica, N. Y.
- March 21-25—Show, Deadwood, S. D.
- March 28-April 3—Show, Manchester, N. H.

THE HARTFORD ELECTRIC BRAKE.

Small Motor Exerts a Thousand-Pound Pull on Brakes Running in Oil, Stopping the Car Gradually but Quickly.

A NEW item of equipment destined to attract much attention at the shows is the Hartford electric brake, made by the Hartford Suspension Company of Jersey City, N. J. This



The Braking Motor is small and can be mounted in any convenient place. Weight of entire system is only 35 pounds.

brake makes the application of muscle to the brakes unnecessary. It increases the efficiency and certainty with which the brakes operate and should still further popularize driving of gasoline cars among women.

The device aims to revolutionize automobile braking system, much as the Westinghouse air brake changed braking on the railroads. The principle is equally applicable to use on railroads and it is being developed for that purpose. Its great advantage for that work would be the reduction in the weight and size of the braking system that it makes possible.

The system consists of a small electric motor designed to pull a brake cable at a pressure of about 1000 pounds. A worm at the end of the armature shaft drives a gear at a reduction of 100 to one. This operates a drum at a reduction of four to one, so that the total reduction is 400 to one. A steel brake cable is wound on the drum and this transmits the pressure to the brakes.

The action of the brake is controlled by a small lever placed in easy reach of the driver—usually on the steering post. A slipping clutch in the brake mechanism prevents the application of any pressure in excess of 1000 pounds and a ratchet holds the brake tight after it has once been drawn up and until it is released by the operator.

How It Was Developed.

This brake was developed as a by-product of certain experiments carried on by E. V. Hartford on an electric starting apparatus.

A small and very high speed electric motor had been designed and this was worked through

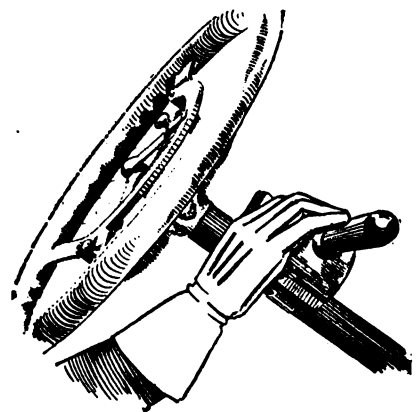
a gear ratio of 125 to one. It showed great power at the torque. An 18-inch lever was placed on the torque end and a long rope attached to the end of this. Its pull was so great that six men could not stop it.

It occurred to Mr. Hartford that here was a basic operating principle of a braking system for railroads. The large gear reduction served two purposes. It served to create great pressure efficiently, which at the same time, as the motor was obliged to make 125 turns to one turn at the power end, could be easily divided up so as to give the necessary control when it was desired to apply the pressure by progressive steps.

Not for some time did Mr. Hartford conceive the idea of a small brake based on the same principle for motor cars. At first he thought the present hand brake was sufficient, but it later occurred to him that women and people of weak physique would appreciate a power brake.

The great power of the electric motor if applied to the ordinary hand brake would cause skidding at once, so a change in the mechanism of the brake itself was necessary. The first automobile manufacturers had used leather linings. These had some satisfactory qualities, but they were likely to burn out on a long hill and make fatal accidents possible.

Then for a time brakes were built with metal to metal contact and after that a fabric of asbestos in which copper wire was interwoven was developed. This had the advantage of applying the power progressively. In ordinary usage the fabric would not burn out, though occasionally it did when used severely. It was necessary to use great care to keep the oil



Hartford Electric Brake Controller
Its operation is simplicity itself

with which the axle is lubricated out of the brakes.

In the new brake designed by the Hartford company the drum was purposely lubricated. Into the top of the brake band a lubricating cup is screwed. It has a small poppet valve, the stem of which extends far enough down so that at every application of the brake a little oil and graphite is admitted to lubricate the components in direct proportion to their use. This film of oil, in connection with the great pressure applied by the brake, achieves results that were never possible before. The pressure is equalized on the two wheels—which is impossible with the present practise of dry brake lining.

One of the most remarkable results, however, is the fool proof character and automatic progression of the brake action, for, on account of the film of oil, it is impossible to absolutely lock the wheels. The oil must be squeezed out and redistributed before this can occur. This is done at such a rate of progression that the friction between the brake band and drums never exceeds the friction of the road wheel and the road until the car is brought to a standstill.

This makes it possible to apply the full power of the brake on wet asphalt without chains and without skidding. The stop is made in a shorter time than was possible before. All grind on the rubber tires is eliminated and tests made for nearly two years show that the mileage secured from the rear tires is nearly double that in ordinary practise.

The weight of the equipment is about 35 pounds, but it adds less than that to the weight of the car, as the emergency brake lever and much of its apparatus is removed. The brake requires for operation a 40-ampere flow of current for two-fifths of a second. It can be used on any car that has a generator and a storage battery.

The control lever can be placed on the steering column just below the steering wheel, where it can be easily reached by the fingers of the driver's hand. A pull on the lever sets the brake and it is released when the lever is pushed back to its original position.

OILLESS BEARINGS TO BE SHOWN.

At the New York automobile show will be shown at space D-132, the Dann Spring Insert Company's "Amalgamite" spring eye bushings and bearings in operation without oil or grease. This manufacturer announced a few weeks ago the production of bearings, etc., made of a metal

which did not require grease and oil. The metal is designated as "Amalgamite" and bushings and bearings made of it will be operated for the benefit of show visitors. One display will be bearings carrying rotating shaft under continuous load and maintained speed without oil or grease.

MOTOR CAR COST SYSTEM FREE.

A booklet containing pages arranged to make it possible for any motorist to keep a complete cost record on his car has been issued by the Walden-Worcester Wrench Company, Worcester, Mass. Each alternate page is occupied by advertisements for the Walden Worcester products, but the other side should be very useful to the motorist who is interested in what it costs to maintain his car.

Pages are supplied for entering records of all gasoline purchased. Spaces are provided for the date, name of dealer, number of gallons, price, speedometer reading and average miles per gallon. Similar spaces are provided in the booklet for recording cylinder oil purchases. Those spaces for heavy oil are divided into transmission, differential and clutch. Tires and tubes are similarly accounted for. There is a touring section for recording the name of the hotel at which the motorist stops, and there is a page devoted to repairs and other expenses.

FRANKLIN IN ECONOMY TEST.

A Franklin enclosed sedan in an official test by the Automobile Club of America recently covered 1046 miles, from Chicago to New York via Albany, Buffalo and Toledo, on one gallon of oil. Bad road conditions and storms were encountered en route.

The total net running time was 60 hours and 18 minutes. The average speed was 18.9 miles per hour. The car was a strictly stock job and was accompanied by official observers.

EMPIRE ADOPTS NEW MOTOR.

The Empire Automobile Company, Indianapolis, Ind., has announced that a Continental motor will be used in its six-cylinder Empire chassis. A Pennsylvania motor has been used heretofore. The change does not involve an increase in the selling price of the cars.

The Continental motor adopted has 3¼-inch bore and 4½-inch stroke and is said to be capable of developing 47 horsepower.

PRACTICAL MOTOR CAR REPAIRS

SHAFT keyways can be cut with the aid of a lathe without necessitating special equipment. The cutter tool shown in Fig. 118 A is not

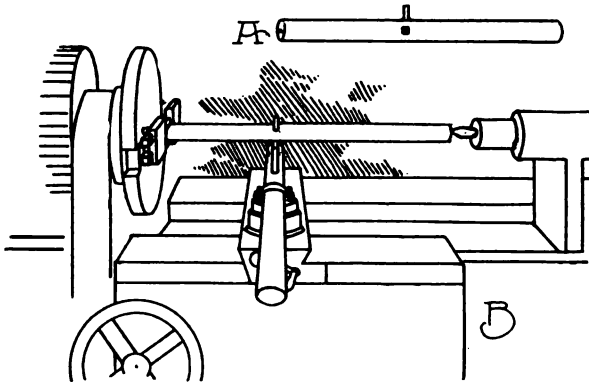


Fig. 118—How to Cut Keyways in Shafts by Utilizing a Special Fixture on a Lathe.

unlike an inside boring tool. The cold roll shaft is slotted in the middle and the cutter is held by a set screw. The shaft is then centred at both ends and fitted to the lathe as shown in Fig. B. The work is clamped to the carriage on the bed of the lathe and fed to the cutter by the cross feed.

EASILY MADE SPRING SHACKLE.

Many times a spring shackle will become so worn that it is practically useless and must be replaced. If a new one is not readily obtainable a suitable substitute can easily be made by the method shown in Fig. 119 B. A piece of steel about $\frac{1}{2}$ -inch thick and $1\frac{1}{4}$ inches in width should be cut to the proper length and a hole drilled near each end. Bolts are then inserted in the holes and passed through the axle, where they are securely locked by washers and nuts.

CRANK HOLDER.

Most cars are equipped with a leather holster for holding the starting crank when it is not in use. It is generally suspended from the frame by leather straps. A better method is shown in Fig. 119 A. Remove leather strap and in its place use a spring of sufficient length to keep a constant tension on the crank. A metal eyelet should be inserted in the holster so that the spring will not tear the leather. The spring can be fastened to the frame by wire or other means. The advantage

of this arrangement is that the crank is restrained from swaying and consequently wearing the bearing. The crank cannot free itself from the holster.

HANDY DIE HOLDER.

It is often necessary to cut threads on parts located in very inaccessible positions. A die holder that will be found to be very valuable under such conditions is shown in Fig. 120 C. Form the holder from a piece of round, cold rolled stock, the bore being sufficient to take the die. A hole should then be drilled and tapped through the side of the holder so that a small set screw can be inserted to hold the die. Next drill a hole through the top of the holder so that a short length of pipe can be forced in. If the pipe is not held firmly it should be brazed. Four holes should then be drilled through the pipe at right angles so that a small rod can be used to provide leverage in turning.

HOME-MADE TAP WRENCH.

Many repair shops obtain profit from the spare moments of the repair men by having them make handy tools. Fig. 120 B illustrates a very convenient tap wrench that can be made in that way. The handles are made from bars of steel that are one inch in diameter and about 12 inches in length. The pieces are placed in the lathe and shaped as shown. About four inches from the end the pieces are turned down to $\frac{1}{2}$ inch in

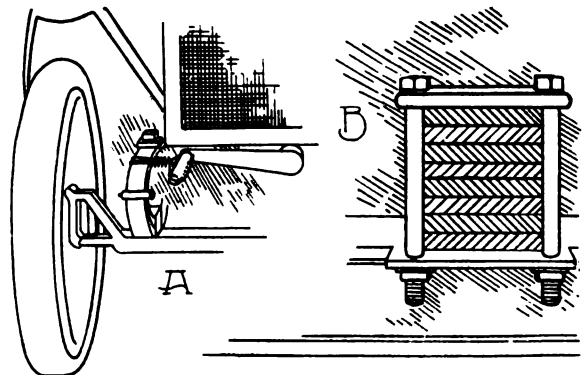


Fig. 119—A, An Efficient Crank Holder Made of a Spring; B, An Easily Made Spring Shackle.

diameter and threaded. The wrench part is made of two pieces of steel, which are one inch square and about three inches in length. Two holes

should be drilled in each block as shown, one hole being drilled and tapped $\frac{1}{2}$ inch, while the other is a clearance hole for $\frac{1}{2}$ inch. A V slot is then

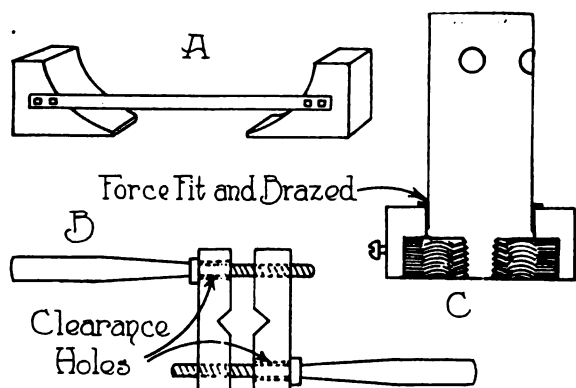


Fig. 120—A, Home-Made Chucks for Making the Car Absolutely Stationary During Repairs; B, a Simple but Practical Tap Wrench; C, a Handy Die Holder.

filed in the centre of each block. The assembly is simple. The threaded part of the handle is first passed through the clearance hole of one block and then screwed into the hole of the other block. The other handle is assembled in a like manner.

CHUCKING WHEELS OF A CAR.

When the car must be jacked for any purpose, such as removing the rear end, etc., it is imperative that the front wheels should be positively chucked so that the vehicle cannot move. Repair men doing considerable work of that character find that the chuck shown in Fig. 120 A is convenient and that the car will not move when set. It consists of two angular shaped blocks of wood joined together by a steel rod. Of course a chuck of this type should be used for each wheel. They are easy to carry about the shop and are not liable to become lost.

KEEPING THE GARAGE DOOR CLOSED.

This is the time of the year when it is desired to keep the garage door closed. Patrons passing through the large sliding door generally do not close it after them. If the suggestion in Fig. 121 is adopted this trouble will be overcome easily. A wire cable is attached to the top of the door, as at A, and carried around pulleys B and C. The weight D, which is heavier than the door, is attached to the end of the cable. Whenever the door is drawn partly open it will always be closed by the weight.

With this arrangement it is necessary to make provision for holding the door open to allow a car to pass out. This is accomplished by attach-

ing the rigid hook E to the end of the door. When the door is opened to the extreme, the hook engages with a locking arrangement attached to the inside of the door shield, as at F. This device is somewhat like the hook, but is inverted. The end of this catch is angular in form, so as to provide a gradual engagement with the hook. The catch operates on a pivot and has a strong coil spring under it, as shown at G. The stud H prevents the catch from being raised too high. A wire is attached to the end of the catch and is carried down and through the door shield, and has handle I, attached to it. The action is simple. By opening the door to the extreme the catch automatically locks and holds it. A simple pull on the handle will release the catch and the weight will compel the door to close.

CRACKED INTAKE MANIFOLDS.

When fitting new gaskets between the intake manifold and the cylinder, extreme caution should be exercised when tightening the nuts. If the manifold is made of aluminum and of light construction, it is very brittle and may crack easily. If it should be cracked and the break is slight, a temporary and often a permanent repair can be made by applying several coats of thick shellac to the part, allowing each coat to dry thoroughly.

USING LATHE AS SHAPER.

A garage equipped with a lathe often has no milling machine or shaper, in which case much of the work accomplished by the latter machines can be done in the lathe if the following suggestion is adopted. A method of cutting a keyway

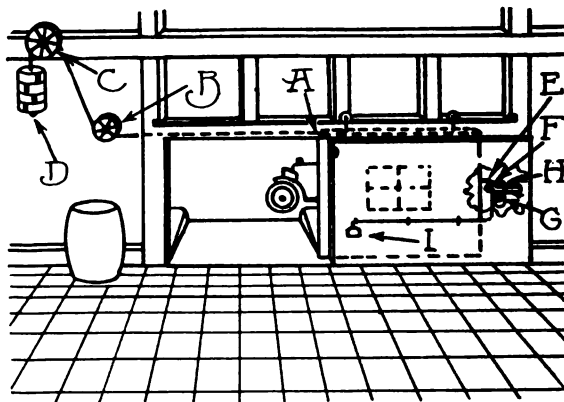


Fig. 121—How to Provide for Automatic Closing of the Garage Sliding Door.

in a shaft is illustrated in Fig. 122. Place the work on the centre of the machine. Remove all backlash of the work by placing leather wedges

behind the dog in the face plate, and throw in the back gearing so as to prevent any movement. Lay a square nose finishing tool on its side on

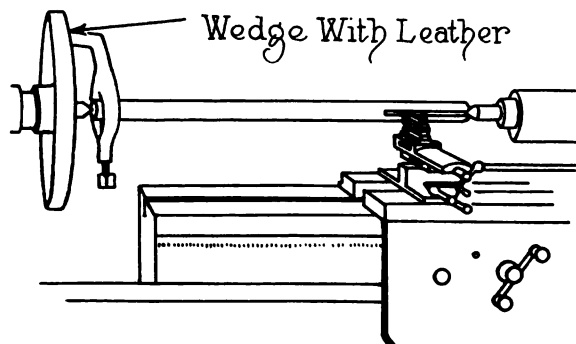


Fig. 122—A Practical Substitute for a Milling or Shaping Machine.

liners until it is accurately in alignment with the centres. It can be held in position by using a cross piece and two bolts. By working the carriage backward and forward by hand, the tool may be fed in at each cut and in this manner a very neat keyway may be planed on the shaft. Keyways can also be cut in pulleys in the same manner. Place the pulley in the chuck and place a square nose tool in the boring tool holder. The pulley should be adjusted until the proper depth of the cut is obtained.

STICKING GASKETS.

It is often found when overhauling a car that the gaskets adhere to the metal parts and must be scraped off. This, of course, necessitates the use of new gaskets, which, besides being troublesome to the workman, is a source of expense to the owner. This condition can be avoided if both sides of the gasket be coated with flaked graphite when assembling. This substance is not affected by heat or cold and will allow the gasket to be removed as a unit.

SMALL JACKS.

When making repairs, especially on trucks, there are many force fit parts which cannot be removed from the shaft except by placing the assembly in an arbor press. Under such conditions the small jack in Fig. 124 B can be used advantageously. The jack consists of a $\frac{1}{2}$ -inch cap screw and a short length of piping or tubing. If the end of the screw cannot be placed on a solid bearing surface it should be grooved so as to bear on any projecting article. Usually two such jacks are used, they being placed at opposite points. By holding the head of the screw

with a wrench and turning the nut with another wrench the forcing process is gradual but positive.

STRENGTHENING FACE PLATES.

A face plate of a lathe in a certain repair shop became so cracked that it was practically useless. Not wanting to be delayed by the time required to have it welded by the maker, the workman repaired it as in Fig. 124 C. A steel band was formed to fit the periphery of the plate. This was then heated to a red heat and pressed over the plate. When the band became cool the metal naturally contracted, producing a tight fit. This repair has proved serviceable for a number of years.

EMERGENCY WHEEL PULLER.

Should it ever be necessary to remove a rear wheel when on the road and a wheel puller is not at hand, an emergency device can easily be made by using the hub of the wheel, as shown in Fig. 125 A. Insert a small block of wood of the proper size to allow the hub to be screwed partly on. It is obvious that by screwing the hub cap on further the wheel will be forced from the axle. A few sharp blows on the cap with a light hammer will often assist the operation. This method of removal, however, is not recommended when the cap is constructed of light material.

RAISING A HEAVY COUNTERSHAFT.

The labor of placing a heavy shafting in its hangers on a ceiling can be greatly simplified if the suggestion in Fig. 123 is adopted. The principle is much like that of the Spanish windlass.

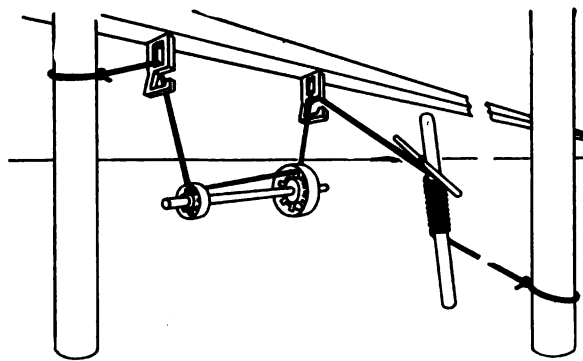


Fig. 123—How Heavy Weights May Be Raised Easily.

Tie one end of a strong rope to a convenient upright and pass the other end through the hangers and the pulleys of the countershaft, as shown in

the sketch. Loop the rope around a wooden roller that is about four inches in diameter and standing upright. Insert a rugged bar into the loop,

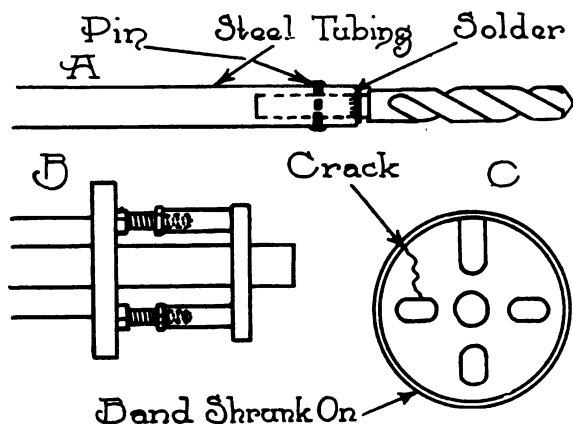


Fig. 124—A, Home-Made Drill Extension; B, Small but Powerful Jacks That Can Be Made in the Garage; C, One Method of Strengthening a Lathe Face Plate.

as shown. Simply by turning the bar as you would a pencil in a tourniquet, the rope is wound up on the roller, which causes the countershaft to be raised to the hangers with comparative ease. The rope should be protected from chafing on the hangers and shafting by being wadded with bagging or other material. This method can be applied to a large variety of purposes, and the uninitiated will be surprised by the ease with which heavy weights can be lifted.

MAKING EXTENSION DRILLS.

Extension drills frequently can be used to advantage when doing work on the various automobile parts. A practical extension can be made of a length of tubing, Fig. 124 A. One end

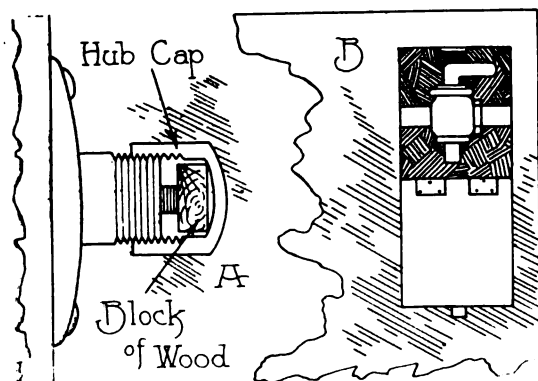


Fig. 125—A, a Simple and Effective Emergency Wheel Puller; B, Trap Door, Allowing Access to Fuel Cock.

of this tube is drilled to a force fit for the shank of the drill. The drill is then pressed in and soldered. The assembly can be made firmer by in-

serting a pin through both. When drilling through the shank it is advisable to use turpentine on the end of the drill if the shank appears to be hardened.

BENCH ANVIL.

A handy bench anvil for riveting and straightening purposes can be made from a small section of a discarded steel rail, as shown in Fig. 127 B. The end can easily be formed by cutting with a hack saw and finishing on a grinding wheel. Holes should be drilled through the bottom of the rail so that it can be bolted to the bench.

HANDY DOOR TO FUEL COCK.

Many owners make it a practise upon leaving the car for any length of time to shut off the supply of fuel to the carburetor. This precaution is

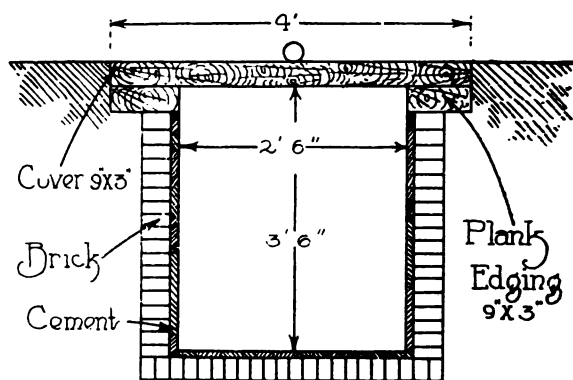


Fig. 126—Constructional Details of a Pit for the Garage.

taken because of a leaky carburetor and also to lock the machine so that it cannot be operated. Usually the shut off valve is located in an inaccessible place and often necessitates the removal of the floor boards to operate it. Fig. 125 B illustrates how one motorist overcame this inconvenience. The floor board was removed and the part nearest to the valve was sawed out and inside hinges and a catch fitted. When closed the door is not readily detected.

HANDY SCRAPER.

An easily made scraper for smoothing rough and sharp edges is shown in Fig. 127 A. It consists of a discarded three-cornered file, one end of which has been sharpened on a grind stone. A scraper adapted to work on bearings is illustrated in Fig. 127 C. It is made from a semi-round file. The sharp cutting projections of the file should be ground off, and the file heated to a red heat

and a gradual bend made near the end. When the file is hardened and a handle fitted to the prong, a practical and economical scraper is the result.

CLEANING SHELLAC BRUSHES.

A brush that has been used for spreading shellac may be easily and readily cleansed in soap and water if done before the shellac sets. When it has become hard alcohol is generally used as a solvent because of its cutting action on the gum, which is the principal ingredient.

PIT FOR THE GARAGE.

A pit in a garage is a decided convenience. At Fig. 126 is shown the working plan of a practical and inexpensive pit. The depth is three feet six inches, which is the average of standard pits.

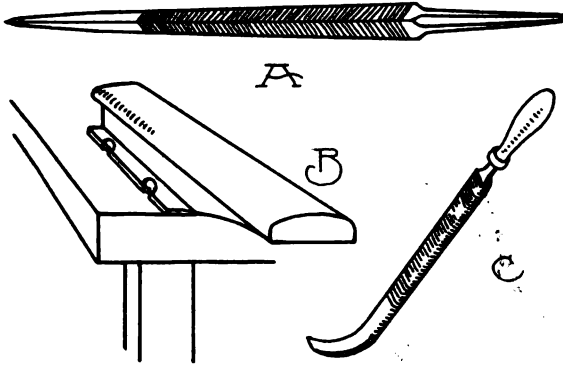


Fig. 127—A and C, Two Types of Handy Scrapers Made of Cast Off Files; B, Handy Bench Anvil Made of a Piece of Steel Rail.

The width is $2\frac{1}{2}$ feet, which is ample space for the work man without causing undue cramping. The length is about four feet. In the design shown the retaining walls are made of brick, being laid flat and up to within six inches of the garage floor. The bottom of the pit is also formed of brick. A lining is then made of cement. Nine by three-inch planks are used to form the support for the cover boards, which are also of the same dimensions. These boards should be fastened together and a ring attached so that the cover can be removed.

TESTING CONNECTING RODS.

If smooth operation of the motor is to be obtained, the top and bottom bearings of the connecting rods must be true and parallel. There are several tests for this, but the one used in a large repair shop doing work on high priced cars

is one of the simplest and most practical. It is shown in Fig. 128. The necessary equipment includes two mandrels, a level and a lathe. The

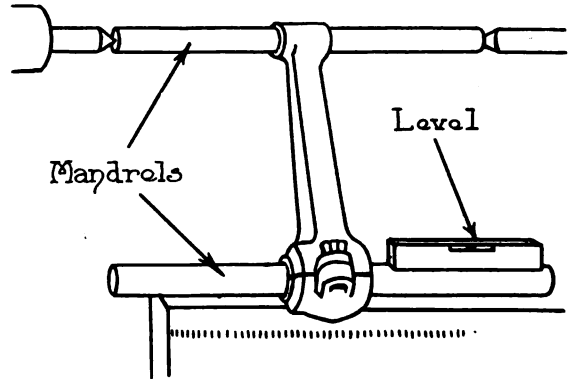


Fig. 128—A Practical and Time Saving Method for Testing Connecting Rods.

mandrels are first placed in the lathe and accurately turned to fit the connecting rod bearings. They are then inserted in the bearings and the mandrel through the upper bearing placed between the centres of the lathe. The level is then placed on the mandrels as shown. The positions of the mandrels may be changed for tests.

ARBOR PRESS STAND.

One repair man who did not want to purchase a stand for an arbor press, made a substantial substitute from pipe fittings, as illustrated in Fig. 129. The stand consists of four flanges, which serve as feet, four upright lengths of pipe, two cross lengths, four short lengths, four tee joints, four elbow joints and two lengths of pipe to connect the elbows. The arbor press is placed on the two cross lengths. It is firmly held in posi-

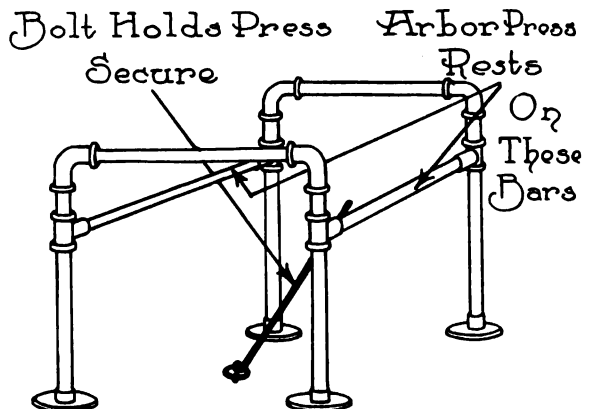


Fig. 129—How to Construct Stand for Arbor Press.

tion by a hook fastening at the lower end to a ring in the floor and bolted at the top end to the press. The arrangement is extremely rigid.

SUGGESTIONS FOR THE FORD CAR OWNER.

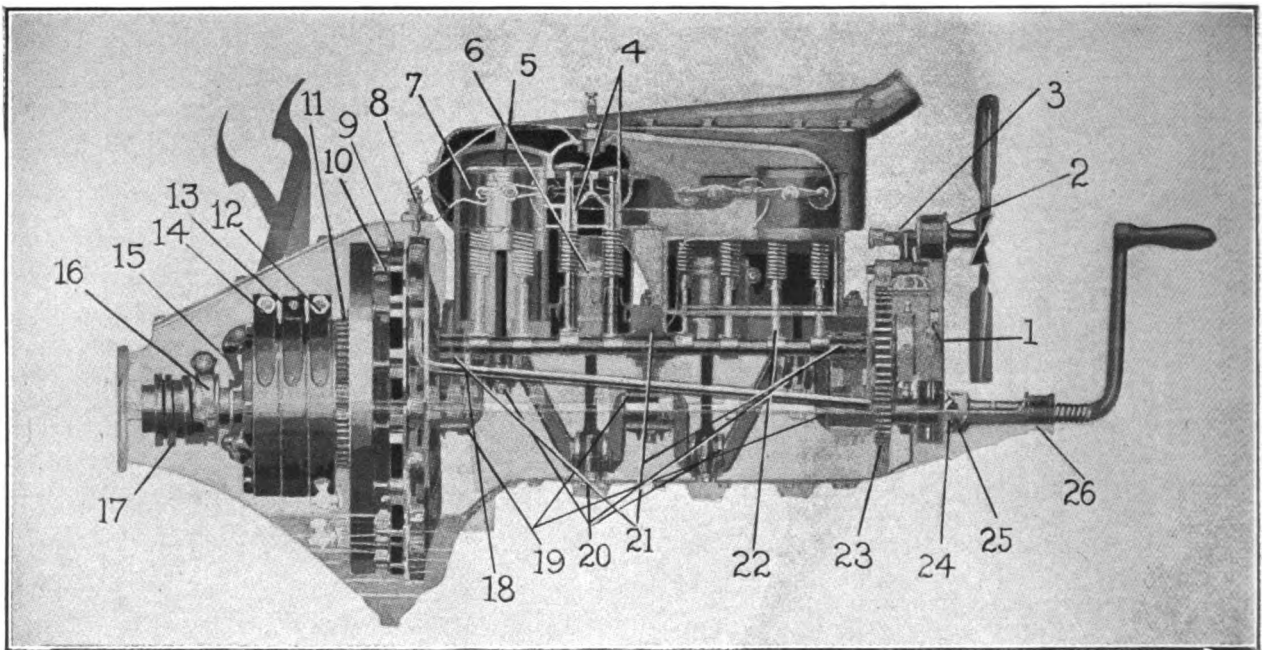
Wear That Results From Normal Use When Reasonable Care and Attention Is Given and the Parts and Places Where This Will Be Noted.

The 38th article dealing with the construction, operation, maintenance, care and repair of the model T Ford chassis is devoted to a consideration of the mechanical conditions resultant from normal wear incident to use with suggestions for determining these, so that adjustment and restoration can be made.

OPERATING efficiency is greatly desired by every car owner despite the fact that more automobiles are deteriorated through neglect or abuse than from normal use, and every person owning or driving a machine has some standard by which he determines whether the power creat-

or units of the entire vehicle chassis.

A characteristic of the human race is to imitate. The man who has no theoretical or practical knowledge of mechanics is generally obsessed with the belief that because another drives an automobile that he, too, can drive one, although he will admit that he must learn to operate the levers and pedals by which such vehicles are controlled. Were he not so blindly confident of his own ability to meet and practically deal with whatever situations that might happen he would undoubt-



The External and Internal Parts of the Engine Where Wear Will Be Noted by Examination.

- | | | |
|-----------------------------|--------------------------------------|------------------------------------|
| 1—Timer. | 10—Magneto Magnets. | 18—Crank Case Oil Tube. |
| 2—Fan Shaft Bearing. | 11—Transmission Gears. | 19—Main Bearings. |
| 3—Fan Shaft Bracket. | 12—Reverse Band. | 20—Connecting Rod Bearings. |
| 4—Valve Guides. | 13—Low Speed Band. | 21—Camshaft Bearings. |
| 5—Pistons. | 14—Transmission Brake Band. | 22—Valve Push Rods. |
| 6—Piston Pins. | 15—Clutch Fingers. | 23—Timing Gears. |
| 7—Piston Rings. | 16—Transmission Clutch Shift. | 24—Crankshaft Starting Pin. |
| 8—Magneto Contact Assembly. | 17—Transmission Clutch Release Ring. | 25—Starting Crank Ratchet. |
| 9—Magneto Coils. | | 26—Crank Case Front Frame Bearing. |

ed is sufficient, whether it is functioning as designed to function and whether there is need of what is generally referred to as attention—really meaning mechanical attention—which includes cleaning, adjustment, restoration, or renewal of the different parts that make up the groups

edly hesitate—perhaps give over the idea of owning a machine until he had studied and had grasped the fundamentals of the mechanical principles of operation and construction.

The man who has practical experience with motor vehicles understands his own weaknesses

and because of this he is inclined to seek the advice of others. Not only this, but he will not undertake what he cannot carry out, as he knows that skilled work is needed to adjust or restore a machine and an error will necessitate additional expense, while his own time will be wasted and loss of vehicle service will be added to his annoyance.

Practical Mechanical Upkeep.

The purpose of this article is to point out the practical upkeep of an automobile. There will be, naturally, consideration of principles that may in a general way be applied to all motor vehicles that are driven by gasoline engines, but attention will be given as well to those conditions that are peculiar to the model T Ford chassis. This will be followed by a series that will treat in a similar manner with adjustment and repairing, doing this work systematically, and describing and illustrating methods that have been found the most productive of good results by those who specialize overhauling and repairing Ford machines.

While these articles are intended to advise all owners of Ford automobiles what can best be done to maintain them constantly operative, they will, no doubt, be read by those who have had more or less experience, and though some of the detail given will not particularly benefit this class, the writer must assume that the readers desire the fullest information that can be given, and to have the greatest value to all nothing can be neglected.

Another fact must be assumed, and that is that every Ford car owner desires to have his machine efficiently operative; that he wishes to have its best service at the least cost possible; that he purposes to safeguard it against depreciation, and that he is willing to give it his personal attention or have the work done. The information is primarily intended for owners who desire to do their own work, and here the fact may be impressed upon them that whether they undertake the attention to their machines or have them adjusted and repaired by others, the conditions will be brought to their observation by the failure of the vehicle to operate normally.

The Mechanical Expert Must Test.

The expert automobile mechanic or the experienced driver will note in the sound of the operation of an engine or a vehicle moving any material change from the normal functioning, and his ear will inform him that adjustment or replacement is necessary in some instances, but he will frequently meet with a condition that will require extremely careful investigation before the

cause can be learned, and develop at times extremely puzzling situations.

There are numerous causes for failure of the engine to operate. These may be referred to generally as trouble, and the supposition may be that these may be instantly recognized by those who have experience, but his impression, if it exists, is extremely erroneous. There are innumerable reasons for abnormal operation, some of which can be easily determined, but many of them can only be located by systematic eliminating tests. There are, of course, complications, that is, where there may be several causes that contribute more or less to a result, and these can only be developed by careful experiment.

The Automobile a Complex Machine.

A fact that should be emphasized to every one who owns or drives an automobile vehicle is that it is not a simple construction. To the contrary, it is an exceedingly complex machine that is built of several thousand parts, each of which is necessary for operation, and which must be maintained in an exact relation to each other to afford normal efficiency, and any change of these relations will result in excessive wear or will be accompanied by noise that is annoying and unpleasant, if not by rapid deterioration.

One of the characteristics of all internal combustion engines is to fail without any evidence of the cause before failure, while another is to give ample warning of untoward condition for a considerable period. Still another is to develop a fault or loss of power that can only be determined by exceedingly exacting test, and this despite watchful care and the exercise of good judgment in driving.

Those who believe that a machine can be used without careful attention to every part may learn to their surprise that a motor vehicle engine cannot be depended upon unless it is constantly kept fully adjusted. There are numerous conditions that will influence operation, among them being temperature, and in cold weather there will be material changes in operation merely through the effect of chilling the fuel and the oil, which will very generally be improved with the heating of the engine as it is operated.

Hasty Conclusions Cause More Trouble.

Those who have driven machines for long periods are frequently deceived by what will appear to be a considerable change in the power or efficiency of an engine, which may be due to a condition that has resulted from a cause that will correct itself, and drivers and those who have occasion to work on automobiles often hastily conclude that ignition or carburetion is faulty with-

out resorting to simple tests that would demonstrate that such impressions are erroneous.

For instance, there may be irregular firing of an engine, which might be believed to be due to the condition of carburetion, and a slight change in the carburetor adjustment would cause a condition that could not be rectified save by patient test and experiment. One adjustment may necessitate another and each in turn bring about changes that in the aggregate still further complicate the situation, and the difficulty of restoring each to its first relation or to improved relations is apparent.

Operating Efficiency Depends on Driver.

As stated, an automobile may be simplified from the viewpoint of the designer and the manufacturer, but to the man who is not well trained in engine building and operation it is in reality a complicated machine, with which he must deal individually and which he must operate successfully if his pleasure is dependent upon the use that he may make of it.

The automobile is subject to influences that are not always realized. The average gasoline engine may be placed upon a solid stationary base and it may be used for years with comparatively little wear because it is not subjected to vibratory stresses, and it will be driven at constant speed. But the automobile motor is first of all suspended in a frame that is more or less subject to distortion and which cannot afford it such support as it might have if used as a stationary power plant.

Beside this the engine is driven at speeds varying from minimum to maximum and these cause vibrations proportionate to the movement, and there is never what may be considered a constant load. When the engine is built every part is in exact adjustment. It is tested and is ready for delivery. So long as it is in its original condition it will create the power the builder rated it at, but as the parts become worn or the screws and bolts loosen, adjustment is necessary.

Every device that has been conceived and can be practically adapted in motor vehicle construction for securing bolts, nuts and screws firmly in their seats has been tried, but because of the continued vibrations from the operation of the engine and contacts of the wheels with obstacles in the highways, as well as the twisting or "weaving" of the chassis frame and the strains upon all the parts secured to it, the bolts, nuts and screws will loosen.

These bolts might be replaced with rivets to afford absolute security, but were this done the parts could only be reached for examination, re-

pair and restoration by cutting them and replacing them with new, and as the periods between work is decidedly uncertain, and greater expense and more labor would be necessary, no good purpose could be realized by the substitution of rivets, and there would be no end of complications resulting from their use. In fact, no engineer or manufacturer has ever considered any other means of assembling than those now so generally adopted.

Only Neglect Will Cause Abnormal Wear.

The fact that the bolts and screws will loosen with the use of the machine is not to be regarded by the owner as a cause for criticism. So far as possible they are all secured, and there is no reason to believe that there will be any condition to arise that will cause damage unless there is neglect. One of the first duties of the owners or driver is to examine the bolts, screws and nuts, and this can be done systematically with wrenches that are adapted for the different constructions, and what will be found to be surprisingly simple care will be a very substantial protection.

A fault with many drivers is that they do not realize what may happen. That is, they will take for granted what they believe should be a condition rather than learning without doubt what it really is. They will prefer to delay a work because of the time required for it rather than protect their property by doing it at once. They will resort to temporary or extemporized repairs instead of having a work done as it ought to be done, and they will often attempt economy by resorting to what they know to be a makeshift instead of a complete restoration or repair.

Nothing can be gained except increased expense by neglect of a motor vehicle. There is no economy resulting from work by cheap workmen, because they will often bungle, they cannot finish well what they do, their judgment is frequently at fault and they will not hesitate to attempt what they know will be a failure. A motor car is to be regarded as an expensive machine that ought to be given the best of care, and when an owner does his own work he ought to endeavor to produce what will adequately serve him, endure and have appearance.

No man can undertake work without tools, as all mechanics know and most motorists learn through unpleasant experience. Not only this, what can be done in a comparatively short time and with little labor with the tools that are adapted for it may require hours and be perhaps a failure simply through neglect to provide what is necessary. Moreover, a large number of tools is

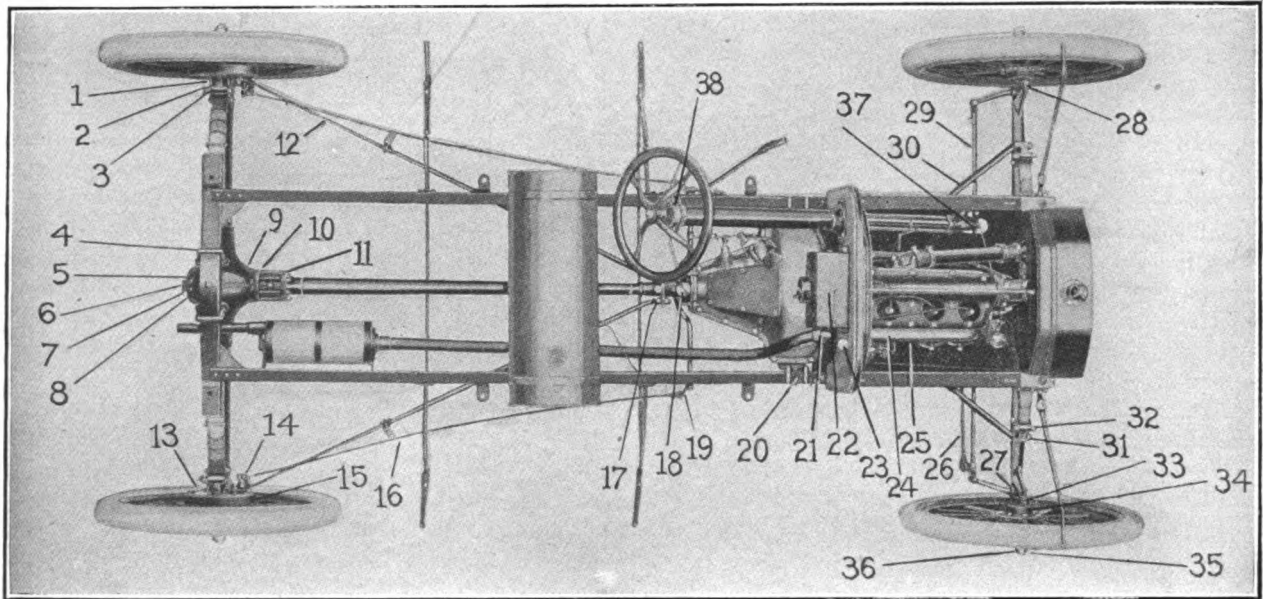
unnecessary, but those that are made for the work are simply indispensable.

Attention Should Be Begun at Once.

In considering the work that should be done in maintaining a new model T Ford chassis, the statement can be made that this should be begun following the first use of the vehicle, and continued without cessation every time the machine is driven. The reason for this continuous and careful oversight is to insure the highest effi-

by the machine that is not so well cared for.

One can safely assume that the work necessary will be practically in ratio to the distance driven unless in the event of accident, although going over the car by formula will require approximately the same time so far as inspection is concerned. Cleaning the car with reference to mechanical care does not mean washing the dried mud, dust and oil or grease from the body and chassis that is exposed to constant view. Wash-



The External and Internal Parts of the Chassis Where Wear Will Be Noted Upon Examination.

- | | | |
|---|---|---|
| 1—Rear Axle Bearing and Sleeve. | 14—Rear Wheel Brake Camshaft Lever. | 26—Steering Gear Connecting Rod. |
| 2—Rear Spring Perch. | 15—Rear Wheel Brake Shoes. | 27—Steering Knuckle Spindle Arm. |
| 3—Rear Spring Hanger. | 16—Brake Rod Support. | 28—Steering Knuckle Spindle Body. |
| 4—Differential Assembly Roller Bearing. | 17—Driving Shaft Housing Front Bushing. | 29—Steering Knuckle Connecting Rod. |
| 5—Differential Drive Gear. | 18—Universal Joint Knuckles. | 30—Front Radius Rod. |
| 6—Differential Spider. | 19—Brake Rod Clevis Pin. | 31—Front Spring Perch. |
| 7—Differential Gears. | 20—Crank Case Arm Bolt. | 32—Front Spring Hanger. |
| 8—Differential Pinions. | 21—Exhaust Pipe Pack Nut. | 33—Front Wheel Stationary Cone. |
| 9—Driving Shaft Pinion. | 22—Coll. | 34—Large Ball Race and Balls. |
| 10—Driving Shaft Roller Bearing. | 23—Dash Carburetor Adjustment. | 35—Small Ball Race and Balls. |
| 11—Driving Shaft Ball Thrust Bearing. | 24—Exhaust Pipe Manifold. | 36—Bearing Adjusting Cone. |
| 12—Radius Rod. | 25—Intake Manifold. | 37—Steering Gear Ball and Socket Joint. |
| 13—Rear Wheel Brake Drum. | | 38—Steering Gear Gearset. |

ciency and the greatest endurance at the least practical expense. Nothing can be named to which can be as well applied the familiar phrase concerning "a stitch in time," etc. This does not mean that an owner or driver shall subordinate everything to vehicle care, but he ought to do the work by system, so that there shall be reason to note conditions each time the vehicle has been driven, and with such attention but very little time is required each day to keep a car in a state of high efficiency, at minimum expense, and obtain a service life far in excess of that afforded

ing and polishing merely improves appearance, but wiping the engine and the mechanism clean and removing all sources of wear by abrasion, testing the bolts and nuts and screws and filling the grease and oil cups and turning the grease cups to force lubricant to the moving parts is imperative.

Constant Lubrication the Greatest Need.

Constant oiling and greasing is the price paid for endurance and efficiency. Lubrication is not obtained by occasionally supplying oil or grease. Continuous lubricity is what is required, and this

cannot be a matter of assumption or guessing. One cannot be certain of the condition of wearing parts without tests. No matter what provision has been made for adjustment, one cannot determine what adjusting should be done unless the parts are tried. The owner or driver must expect wear in all places where moving surfaces contact, and while in some instances noise or lost motion would indicate need of attention, systematic care would compensate such wearing before it developed noise or excessive play.

To illustrate, jacking the rear or the front axle and lifting the wheels, which would require a very brief time and practically no labor, would disclose the condition of the bearings of the driving axle or the front wheel spindles; by jacking the rear wheels the action of the wheel brake can be tested; by trying the driving shaft at the universal joint back of the engine the condition of the joint and the driving shaft bushing can be learned; by removing the valve stem and push rod covers and turning the engine, the relations of the rods and stems can be determined; by feeling the state of the timer and the fan shaft can be ascertained; by the action of the steering gear the adjustment of the linkage is apparent, and with wrenches the seating of the screws and the nuts can be tried.

All these are simple and practical means of finding the relations of the principal parts that may be reached at any time, but the condition of the differential gearset, the driving shaft roller and ball bearing, the connecting rod and main and camshaft bearings cannot be learned without more work. The accompanying illustrations show by figures and keys the different parts of the chassis where internal or external wear may be expected, and by examination of these the reader can learn the parts that should receive his constant attention.

(To Be Continued.)

AMERICAN AND EUROPEAN ROADS.

The backwardness of the United States in good roads construction as compared with the countries of Europe, is strikingly shown in a paper that has just been issued by the American Highway Association.

In the German empire, which is smaller than the State of Texas in area, there are 36,000 miles of state road. Prussia alone has been spending \$35,000,000 a year for roads. In England and Wales, which are less in area than Florida, there are 150,000 miles of road, of which 27,826 are

what are called main roads. Five years ago the local authorities expended on these roads \$32,498,000. In Florida there are 1752 miles of "improved roads."

Great progress is being made in this country, however. Last year's expenditures for roads amounted to \$235,000,000, while 10 years ago the amount was only \$79,000,000. There are in the country 2,240,000 miles of public roads and up to date only 10 per cent. of these have been improved.

ROAD MAINTENANCE TRUCK.

The state highway commission of Illinois has worked out a novel method of transporting necessities for repairing the state aid roads. A maintenance truck has been built by making alterations in a Ford roadster chassis, which makes possible the transportation of a heating kettle for bituminous material, necessary tools and a derrick with which to lift barrels of material on and off the truck.

Gas is used for heating because it can be carried in a small space, and its weight is inconsiderable. One gallon of gasoline will supply enough heat to keep the kettle going during a day's work. The gasoline burners can be started quickly and when the material is once hot one burner will keep it so. The burners work satisfactorily when the car is in motion, so that the material can be ready for use when it arrives.

One expert road man goes with the truck, hiring at each community the labor that is necessary to do the job. Thus bad weather causes little loss of time—as only one man is permanently employed.

NEW LICENSE PLATE LAW FOR IOWA.

A new law will go into effect in Iowa, Jan. 1, by which license plates issued can be used for three consecutive years, saving motorists the annoyance of getting new ones every year. For the last two years of the period notices will be sent to owners asking them to remit their license fees. Registration fees have not been changed. Half the usual fees will be collected on machines used more than four years and half fees will be collected from owners who buy their cars after Aug. 1. Fees are due Jan. 1 and 10 per cent. is added if they are not paid by April 1. After that five per cent. a month is added. Vehicles are subject to lien for unpaid fees.

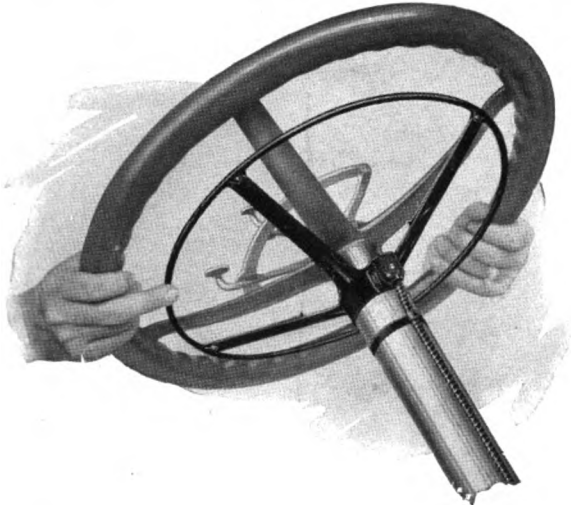
CAR ACCESSORIES AND EQUIPMENT.

ELECTRIC HORN SWITCH.

Ring on Steering Wheel Operates Electric Warning Signal When Touched by the Operator.

A switch by which an electric horn may be operated without removing either hand from the steering wheel is manufactured by the W. P. Seng Company, 1450 Dayton street, Chicago, Ill. It consists of a large non-rusting ring, which clamps on the steering post at a point half an inch from the steering wheel. The horn is operated by simply touching this ring. The operator loses no time in an emergency in reaching for the switch, as it is at his finger ends all the time.

There are two collars, each insulated from the other, the upper one having arms which are integral with the ring, while the lower has arms which extend almost to the ring. On each arm is a German silver contact point, which when brought in contact with another opposite completes the circuit and operates the horn. Fiber bushings are used to keep the two points apart. Installation is very simple and complete directions are furnished with each instrument. The conduit is fastened to the hub band and then carried down the steering post, being



The Assembly of the Seng Electric Horn Switch.

held by the same conduit clamps. The wires are connected to the usual lines under the hood. The retail price of the Seng is \$3 complete with all fittings. A special switch is made for Ford cars and it sells at \$2.50.

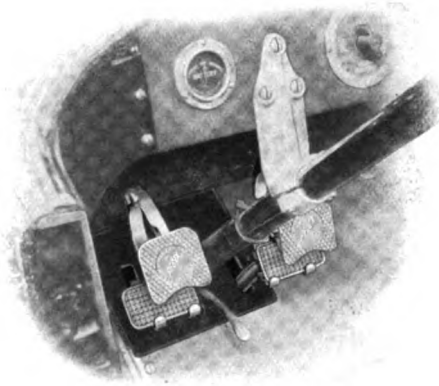
TWO-STEP EXTENSION PEDAL.

Extension Pedal Which Clamps to the Ordinary Pedal and Thereby Accommodates Short-Legged Operators.

It is quite difficult for motor car operators whose legs are shorter than the average to operate the clutch and brake pedals satisfactorily. Some overcome this by placing cushions in the seat, so that they will sit further forward, but at best this is an unsatisfactory makeshift, for it places the operator too close to the steering wheel.

To make it more convenient for such operators, the American Car Accessories Company, 30 Church street, New York City, is marketing Pedex extensions, which can be easily attached to the pedals and are adjustable. They are not permanent fixtures, simply being clamped into position, which arrangement makes it easy to remove them when a person with longer leg reach is to operate the car. However, their removal is not imperative, for the original pedals are still in position and in no way

made inaccessible by the extension pedals, as can be seen in the illustration. Another advantage is that on long trips the driver can relieve the strain due to constant position by shifting his feet from one set to the other.



Pedex Two-Step Extension Pedals.

The pedals are made of high-grade steel, highly polished and nickel plated. The retail price is set at \$5 the pair.

PUNCTURE PROOF TIRES.

Incorporating a Flexible Chrome Leather Strip This Tire Is Guaranteed to Be Puncture Proof.

The Leather Tire Goods Company, Niagara Falls, N. Y., guarantees the Woodworth trouble proof tire, a sectional view of which is shown herewith, to be absolutely free from punctures for a mileage of 5000 miles. The manufacturer agrees to pay the cost of repairing the tire if it is necessary in order to make good his guaranty.

The tires are made of combed sea island cotton and a durable rubber compound. Incorporated into this construction is a non-puncturable strip of chrome leather. Its flexibility

Sectional View of a Woodworth Trouble Proof Tire.

produces a resilient tire which is non-heating. Under normal conditions a greatly increased mileage over the guaranteed 5000 miles can be obtained if used with good tubes. A booklet showing the Woodworth puncture proof tires and a number of other devices of special interest to motorists can be obtained on request when this journal is mentioned.



ABSOLUTE LOCK-NUT.

Device That Locks the Nut Securely Can Be Attached to Any Standard Nut.

The American Lock-Nut Company, Pullman station, Chicago, Ill., makes the Absolute Lock-Nut, for which the claim is made that it cannot work loose when it is once set in position.



Position of the Locking Pin That Holds Nut Securely.

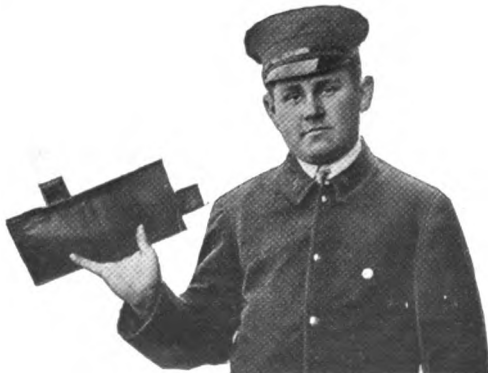
There is a recess cut in the inner surface of the nut in which is located a locking pin of such size that when the nut is screwed on the bolt the angled sides of the pin fit the threads of the bolt. The pin heads have flat surfaces that travel against the angled top of the recess in the nut. Any tendency for the nut to turn back only wedges the pin tighter into the threads of the bolt. To remove the nut a nail is inserted between the wall of the shallow portion of the recess and the locking pin. This allows the nut to be removed easily by retaining the pin in the deep part of the recess, where it affords no pressure against the bolt.

The device has been tested and found successful by many of the largest railroad companies. It is obtainable from the leading dealers or direct from the factory. Those who wish the appliance attached to any standard nut may ship the material direct to the factory. Price lists and further information will be furnished to those who mention this publication when writing.

RAYNTITE FOLDING BUCKET.

Collapsible Water Bucket Which Can Be Folded and Carried Under the Seat Cushion.

A water bucket is an essential of the motor car's equipment, and a collapsible bucket that can be folded



Rayntite Folding Water Bucket.

so compactly as to be placed under the seat cushion is thought to be a necessity by those who look for convenience. In all cases the bucket should be non-leak-

able and made of material that will not become stiff and will not crack with constant folding and unfolding.

Such a bucket is manufactured by the Du Pont Fabrikoid Company, Wilmington, Del. It is made of water proof rayntite, the same kind of material that is used so successfully in the manufacture of tops for automobiles. All seams are stitched and then cemented with a special adhesive that prevents leakage. The material will not harden nor crack even with practically constant use. As seen in the accompanying illustration, it is collapsible into a remarkable small space, which makes it possible to conceal it in almost any convenient place in the car, especially under seat cushions. The bucket has capacity of $1\frac{1}{2}$ gallons and is so constructed that the water flows easily into the radiator opening without splashing. The price is 75 cents each.

STEELE'S SPEED LIMIT CONTROL.

Tachometer Which Can Be Set to Break Ignition When Engine Is Operating Faster Than Desired.

Steele's speed limit control, manufactured by W. M. Steele, 98-100 Beacon street, Worcester, Mass., automatically prevents the revolutions of an internal combustion engine from rising above a certain predetermined limit per minute. This is accomplished by breaking the ignition at a certain desired point. It is in reality a safety device, controlling the speed of the motor, but does not in any way interfere with the operator's control of the throttle or power available.

Another feature of the tachometer is that the operator is enabled to manipulate the spark lever more skillfully. He can also determine the number of revolutions that the motor should be operating to successfully meet the requirements of the load.

The device consists of an accurately calibrated dead beat tachometer of the centrifugal fly ball type, which is mounted on the front dash board. The drive is by a flexible shaft consisting of closely wound music wire, enclosed in a flexible tubing. A positive gear connection is made to the motor, preferably to the magneto shaft. The gears are hardened steel spirals and operate in grease.

Within the instrument are two platinum points, which can be adjusted to contact when the engine is operating at the determined number of revolutions per minute. This, of course, should be the maximum speed in miles that it is desired to operate truck when it is in high gear. When the points contact, a wire leading to the primary circuit of the ignition system is grounded and, of course, the engine ceases to operate until the contact is broken.

Steele tachometers are produced in surfaced and flush types. They are absolutely fool proof, as all adjustments are enclosed and when once set cannot be tampered with. They are finished in durable gunmetal. The complete outfit retails at \$75.

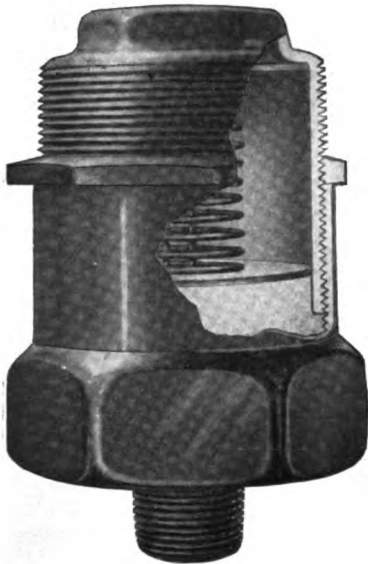


Steele's Speed Limit Control.

AIRSPRING AUTOMATIC GREASE CUP.

Device by Which Lubricant Is Fed by Compressed Air and a Light Spring.

Uniform pressure and automatic feed of lubricant are essential qualities in grease cups. These features have been attained in the airspring automatic grease cup manufactured by the Hunter Pressed Steel Company, Orthodoxy and Horrocks streets, Philadelphia, Penn., which is shown in the accompanying illustration. In this cup the grease is fed by the employment of compressed air and a light spring. Compression in both spring and air is obtained by screwing down the cup, in the conventional manner. The pressure upon the grease is consequently uniform.



Airspring Automatic Grease Cups.

larly to motor vehicles. They are made in four sizes and are finished in plain or polished steel. If desired, however, a brass or copper finish may be obtained upon specification. The prices range from \$1 to \$3, with a 50 per cent. discount to the consumer and a special discount to the trade. Further information can be obtained from the company by mentioning this publication when writing.

GLOBE TIRE SAVERS.

Equipment Which Raises Weight of Car from Tires When Standing and Prevents Formation of Flat Spots.

If a car is allowed to stand for a considerable period, the weight of the machine gradually causes the fabric of the tire to weaken at the point supporting the load. The Globe tire savers, one of which is shown in the accompanying illustration, and is manufactured by the Globe Accessories Company, 1104 Prospect avenue, Cleveland, O., are designed to prevent this by raising the tires and thus affording a uniform pressure throughout. They also prevent flat spots from forming by raising the tires from cold, wet and oil soaked floors. The equipment is made of the best quality cold rolled steel and can be adjusted from 13½ to 18½ inches to fit any car. The inclined lifting column rests squarely on its base when supporting the load, and the lifting lever is offset so that it cannot contact with the wheel, tire or garage wall when raising or lowering the car. The equipment is finished in durable black enamel. The set of four retails at \$4.50 and is



Globe Tire Saver.

fully guaranteed. Please mention The Automobile Journal when writing to the Globe company.

FRIESTEDT RIM CONTRACTER.

Tool for Quick and Easy Removal of Tires from Straight Side and Clincher Split Rims.

Kinked rims, which afford a wobbly appearance of the wheels, are often the result of forcibly prying off tires. A tire will frequently become so firmly fixed that it resists removal until subjected to much twisting and pulling. This treatment forces the flaps out of shape and the tire can only be replaced on the rim when guided by a screw driver or some other similar instrument. This practise should be discouraged, because of the possibility of puncturing the inner tube with the instrument.



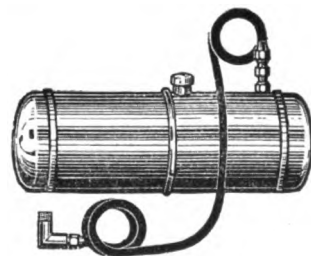
How the Contractor Operates.

The Friestedt Rim Contractor Company, 2934-6-8 West Lake street, Chicago, Ill., is manufacturing the accessory illustrated herewith for the quick and easy removal of tires from straight side and clincher split rims, which are standard equipment on Reo, Studebaker, Overland, Chalmers, Peerless, Hudson, Dodge, King and many other well known cars. The maker states that this tool "does all but repair tire and demount rim from wheel." It does not contact with the tire, but simply grips the edges of the rim with two small hooks and by an attached lever member, raises one end of the rim and overlaps the other. When fully contracted, the lever can be locked, thus holding the rim in the desired position. When replacing, the rim is simply fitted on the tire and the lever released. This tool is guaranteed not to mar the rim. The pressure is concentrated against the rim lock. The price of the Friestedt rim contractor is \$2 and if nickel finished, \$2.25.

H²O VAPORIZER.

Apparatus Which Introduces Oxygen Into the Mixture—Burns Carbon and Prevents Its Formation.

One of the most troublesome possibilities in the automobile motor is the accumulation of carbon. The expense and annoyance caused can only be prevented by eliminating the cause. The H²O Manufacturing Company, 294 Washington street, Boston, Mass., producer of the H²O vaporizer, declares that this apparatus will effectively prevent carbonization. The device consists of a copper tank that can be attached to the exhaust manifold of any motor. It requires no care other than replenishing the water when empty. It has capacity for 2½ quarts, which is generally sufficient for 175 to 250 miles, depending, of course, on the time consumed. It absorbs the waste heat from the motor, thereby forming a water vapor, which is carried to the intake manifold or mixing chamber. Here the vapor mixes with the fuel to produce a more volatile mixture, and at the same time decrease fuel consumption, which is achieved by enrichening of the mixture. Carbon deposit in the cylinder is eliminated during combustion and further formation is prevented. Attachment to the engine is simple and can be accomplished in a very few minutes. The price of the equipment is \$10.

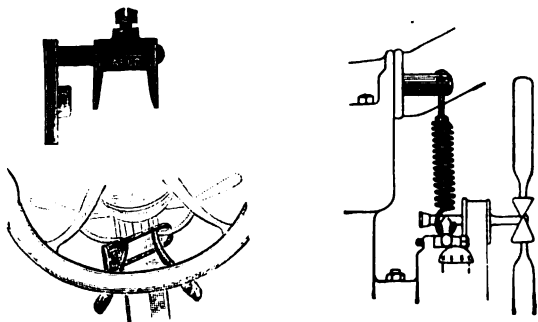


H²O Vaporizer.

APCO SPECIALTIES.

Three New Apco Specialties Which Should Appeal to Owners Because of Practicability and Moderate Cost.

To prevent the Ford car from being used surreptitiously, the Auto Parts Company, Providence, R. I., is producing the Apco spark and throttle lock, illustrated here-



Apco Fan Belt Retainer at Top Left; Spark and Throttle Lock, Bottom Left; Fan Belt Adjuster at Right.

with. The device positively locks these levers in a fully advanced position, thus preventing practical use of the machine. The equipment includes a high grade lock and keys. It sells at 60 cents.

The automatic fan belt adjuster is another new Apco specialty for the Ford car. Its purpose is to maintain proper belt tension at all times. The maker declares that it will increase the life and efficiency of the belt, can be installed easily and will prevent rattling of the fan belt assembly. The construction includes a stud, a helical spring of imported steel and a hook. The adjuster is finely finished. It sells at 40 cents.

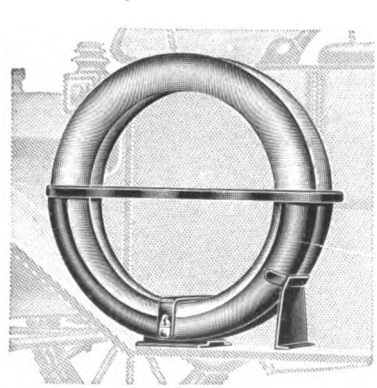
The Apco fan belt retainer is designed for attachment to a crank case bolt to prevent the belt from jumping or leaving the pulleys, as is frequently the condition when the belt is old and slips. The retainer is adjustable, and when once in the correct position requires no further attention. It lists at 20 cents.

When writing to the manufacturer about these devices, please mention The Automobile Journal in all letters of inquiry.

VICTOR-DUPLEX TIRE CARRIERS.

Black Enamelled Sheet Steel Tire Carriers Adapted for Use on Ford Car.

The International Stamping Company, 1852-4-6-8 Austin avenue, Chicago, Ill., is the manufacturer of the Victor and Duplex tire carriers for Ford cars, shown in the accompanying illustration. The Victor

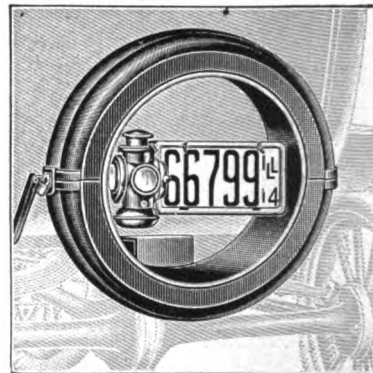


The Duplex Tire Carrier.

is made of sheet steel in three sections, which are formed to properly fit and completely enclose and protect two tires. The Duplex is an abbreviated portion of the lower half section of the Victor and has bars across the top. This company also makes a carrier listed as the Simplex, which is an exact duplicate of the Duplex, except that it is designed for one tire only. All carriers

may be obtained for placement either on the running board or at the rear of the car. Attachment to the rear of the car is simple and effective. The only tools required for this work are a carpenter's brace, bit and a wrench. Locks, directions and necessary bolts are included with each carrier sold. The rear carriers are designed to carry tall light and license number plate.

The list price of the Victor carrier, designed for carrying 30x3½-inch tires, but not having demountable rims, sells at \$10. Another Victor carrier, which will accommodate the same size tire and demountable rim, retails at \$12. The price of the Duplex ranges according to size, from \$4.50 to \$7. The Simplex carrier is also priced according to size, from \$3 to \$5.



The Victor Tire Carrier.

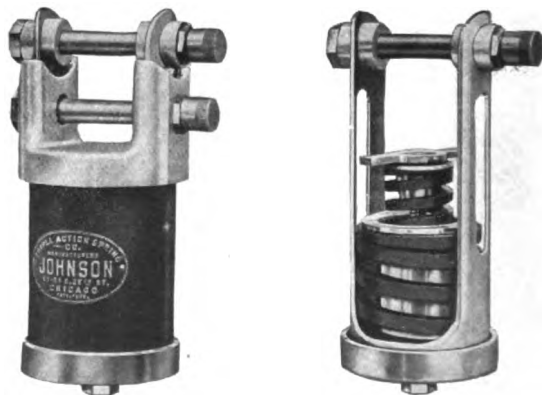
JOHNSON SHOCK ABSORBER.

Meritorious Improvements Noted in the 1916 Model Johnson Shock Absorber.

The Triple Action Spring Company, 55-61 East 28th street, Chicago, Ill., manufacturer of the well known Johnson shock absorber, has recently marketed an improved 1916 model, two views of which are shown herewith. The principle of operation is no departure from previous models, the changes being chiefly in the mechanical design. Instead of the inter-coiled expansion type of spring, a compression type is used in the outer, or heavy coils. By using a steel stirrup hanger for the outer coil and a steel spring cup for the inner coil, the cup passing through the stirrup hanger as the tension increases affords a long, free, resilient action of both inner and outer coils. The inner coil is of lighter tension than the outer coil and automatically produces a variable tension. The rebound of the car is also checked by this small inner coil.

The former top cap has been replaced by one of the closed, weather proof designs, having curved slots for the main stirrup hanger to pass through. At the bottom of the closing is an adjustment bolt, the nut on which is self-locking. This arrangement allows anyone to adjust the absorber to any road or load condition.

Different sizes are designed for the different makes



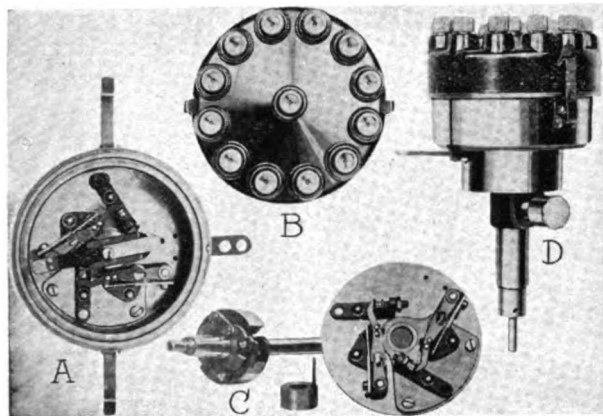
Exterior and Interior Views of Johnson Shock Absorber.

of cars, ranging from the lightest to the heaviest. The price ranges from \$22.50 to \$30 for the pleasure car types, and \$40 for trucks.

REMY DISTRIBUTORS FOR MULTIPLE CYLINDERS.

Ignition Battery Instruments Will Be Made for Four, Six, Eight and 12-Cylinder Motors in 1916.

THE Remy Electric Company, Anderson, Ind., and Detroit, Mich., announces that its production of battery ignition distributors for 1916



The Remy 12-Cylinder Distributor: A, Interior of the Breaker Box Cap, Showing the Two Breaker Arms; B, Exterior of the Breaker Box Cap, Which Carries 12 Terminals; C, Distributor Shaft, Cam and Plate Carrying the Two Breaker Arms; D, the Assembled Instrument.

will include those for four, six, eight and 12-cylinder motors. While no great changes have been made in their design, all Remy units have been refined in several minor details, so as to make them as nearly perfect in operation and endurance as possible.

These improvements make for reliability and efficiency, and at the same time provide that the instruments may be cared for even by persons possessing but little experience in electrical matters. Though they have been made compact and simple, no part has been made to suffer in its ability to withstand a large amount of stress and wear above its normal portion. An outstanding feature is that an extra large bearing is provided for the rotating shaft, and that this bearing is constantly lubricated from a large grease cup.

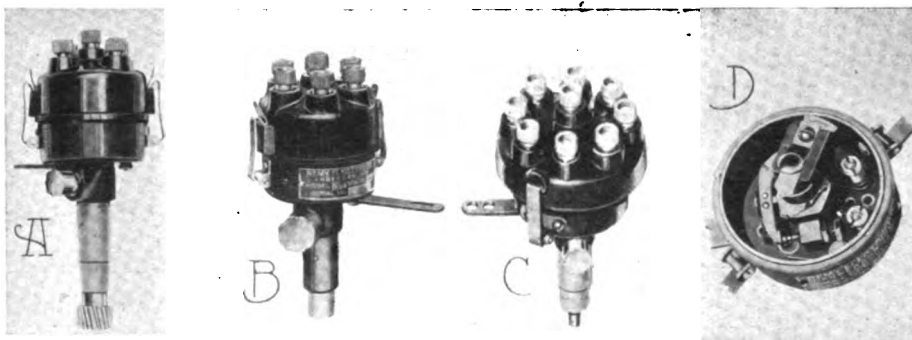
The distributor proper is of the most simple

and reliable type. The high-tension current is distributed by a segment, which revolves close to the pins in the distributor head. The exposed springs, which hold this head in position, are designed to be quickly disengaged for the purpose of removing the head for inspection of the components.

The principle of the breaker mechanism remains unchanged. The circuit is normally closed and the contact points separated by specially ground steel cams. Inasmuch as the spark occurs when the contact points are open, absolute synchronism is obtained throughout the entire range of speed. Developments in the breaker arms and springs, together with the addition of a rebound spring, insure very fast and smooth breaker action to meet the requirements of the high-speed motors recently developed.

The Remy distributor for 12-cylinder motors is a departure from former construction in that two contact breakers are used, both of which are actuated by one accurately finished six-pointed steel cam. One breaker is mounted on a steel plate that is concentric with the central line of the distributor, and has a boss in which is a hole, through which the distributor shaft passes. The second breaker is carried on a smaller plate that is secured to the large plate by a series of screws. The smaller plate is collared around the boss, so that all parts move in concentric circles around the central line of the distributor.

It is obvious that to obtain accurate timing it is necessary that there be an extremely accurate



Remy Distributors for Four, Six and Eight-Cylinder Motors—D, Interior View of the Remy Breaker Box.

relationship between the breakers and the six-pointed cam mounted on the distributor shaft, so that the breaker arms will be lifted alternately. To obtain this close adjustment, the distributor is mounted upon a synchroscope after assembly, and each plate carrying a breaker is moved until each breaker is in the proper position to obtain perfect synchronism. The plates are then permanently secured by screws.

Stiff, double-leaf, flat springs are used to obtain pressure against the fiber blocks that are riveted to the centre of each arm of the contact breakers. This design, together with the light breaker arm, affords a fast, yet smooth breaker action.

The construction of the unit is such that the distributor can be disassembled without the use of special tools. Another feature is that either automatic or manual spark advance, or both, is practical with this instrument. Ample protection is insured the insulation of the system by a safety gap incorporated in the Bakelite distributor segment arm.

With this system of ignition but one coil is used. In building the coils, each winding is passed around a soft iron wire core and each layer is heavily insulated to insure against voltage strains. The windings then are saturated with a special compound that will, the maker declares, resist any temperature to which they may be exposed. They are further protected by a number of pieces of Bakelite, and when completed the coil is enclosed in a lacquered fiber tube to which Bakelite end pieces are fitted.

CHEVROLET BUYS GENERAL MOTORS.

Stockholders of the Chevrolet Motor Company voted at a meeting Dec. 23 to increase the capitalization of the company from \$20,000,000 to \$80,000,000, and empowered the directors to exchange Chevrolet shares for General Motors shares on a basis of five of Chevrolet for one of General Motors. The total number of shares represented at the meeting by proxy was 169,398, and in person 16,242 out of a total of 185,640.

Not all of the 35 shareholders present were in favor of the plan, among the objectors being eastern banking interests, who had been instrumental in financing General Motors a few years ago. Many questions were directed at W. C. Durant, president of the Chevrolet company and the man who in Wall street is regarded as the one who has obtained the financial backing of the Du Pont interests to make him the supreme power in Gen-

eral Motors financial affairs once more.

Mr. Durant said that it is estimated that the Chevrolet company on its present earning basis will show about 20 per cent. on its present capitalization. Thus far, he said, the production had been at the rate of 185 cars daily, and it is estimated that this will immediately be increased to 220 cars a day. By March it is planned to produce 350 cars daily.

Regarding the specific reason for exchange of shares, Mr. Durant explained to his inquisitors that the directors would soon have placed before them the entire proposition and that at present he was not at liberty to make further statements. It was understood that he said other plans which would require capital outlay were to be placed before the directorate at an early date.

Several Detroit automobile men profess to see in the move the triumph of Mr. Durant over the interests by which he was deposed from power in the reorganization of General Motors in 1910. Mr. Durant was active in the formation and direction of the company to the time Boston and New York bankers obtained a loan of \$15,000,000 for the company, secured by six per cent. notes. Mr. Durant was superseded as president by Thomas Neal of Detroit.

At the annual meeting of the stockholders of General Motors, Nov. 16 last, Mr. Durant's returning power was evidenced in his election among the directors or representatives of the Du Pont and other eastern interests that assisted him in winning his battle.

The General Motors Company has authorized capital of \$60,000,000, comprising \$40,000,000 common stock, of which \$16,505,783 was outstanding July 31, this year, and \$20,000,000 of seven per cent. cumulative preferred stock, of which \$14,985,200 was outstanding on the same date.

WAVE OF ROAD WORK IN IOWA.

A wave of enthusiasm for hard surfaced roads has swept over Iowa, according to the service bulletin of the Iowa State Highway Commission. Practically every county in the state is pressing some project for the improvement of its roads with hard surfaced material. The commission complains that in the enthusiasm for hard surfaced roads good dirt roads are neglected. In the commission's opinion there will be thousands of miles of dirt roads for many years and sentiment should support dragging and other work on these roads to keep them in condition.

NEW BRISCOE "TWENTY-FOUR" ANNOUNCED.

THE first new product of the recently enlarged \$6,000,000 Briscoe Motor Company is the Briscoe "Twenty-Four," which has just been announced and will attract wide attention at the shows. Light weight is a feature, the car weighing, when ready for the road, well under 1750 pounds.

The body is a modified streamline type, exceptionally wide in the tonneau, and has a tapering hood. It is swung on four full elliptic springs. A special sofa type spring is used in the seats.

The motor is long stroke. It is especially designed for the car and is made in one of the recently acquired plants of the Briscoe company. The bore is $3\frac{1}{8}$ inches; stroke, $5\frac{1}{8}$ inches; the cylinders are cast en bloc. A two-unit electric starting and lighting system is used. Cooling is by a thermo-syphon system, with a honeycomb radiator. A constant level splash system furnishes lubrication.

The rear axle is a floating type. The differential is a gearless, which gives positive drive to both rear wheels and eliminates all tendency to skidding and side-

sway. With this differential power is always delivered to the "grounded" wheel when the car strikes soft going; the wheel that is "loose" does not spin around.

Transmission is selective, three speeds forward and reverse. Drive is from the left side with centre control. Internal expanding and external contracting brakes operate on 10-inch brake drums on the rear wheels. Tires are 30 by $3\frac{1}{2}$ inches all around, with demountable rims.

Standard equipment includes one-man water proof top, curtains, rain vision windshield, electric headlights and dimmer, electric tail light and license bracket, electric horn, tools and kit.

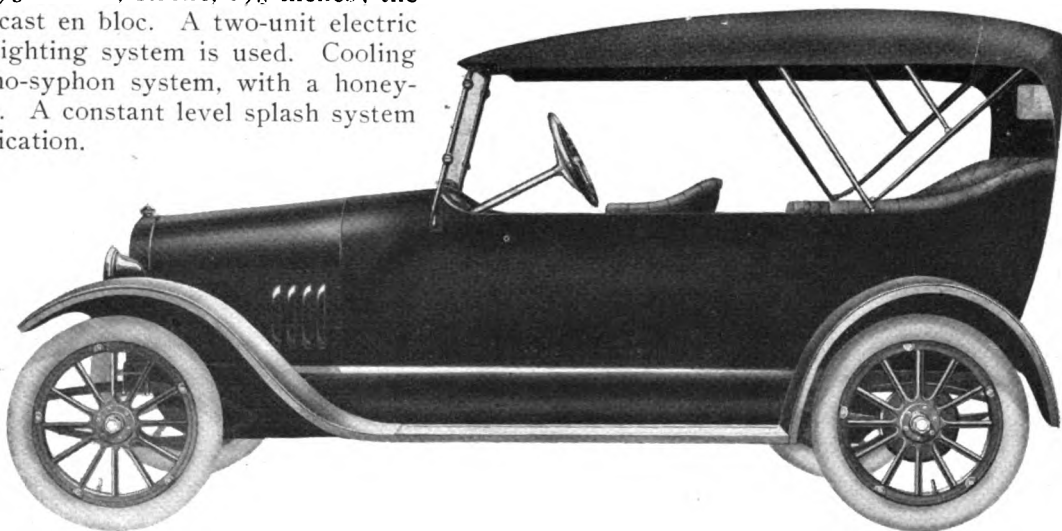
The car will be made in five-passenger touring car and two-passenger roadster models. On this chassis the company will also supply a light delivery standard open body at the same price as

the touring car, which is \$585. Detachable flare-boards will be supplied, and if desired top, side and rear panels.

The other units of the Briscoe line are the four-cylinder "38," which sells at \$750, and the eight-cylinder "38," priced at \$950.

FORD 105,000 ORDERS BEHIND.

Early in December the Ford Motor Company was 105,000 cars behind its orders, although it had shipped 145,000 cars since Aug. 1, when its fiscal year began. This is at the rate of 30,000 cars a month, or more than 1000 cars a day.



Touring Model of New Briscoe "Twenty-Four" Selling at \$585.

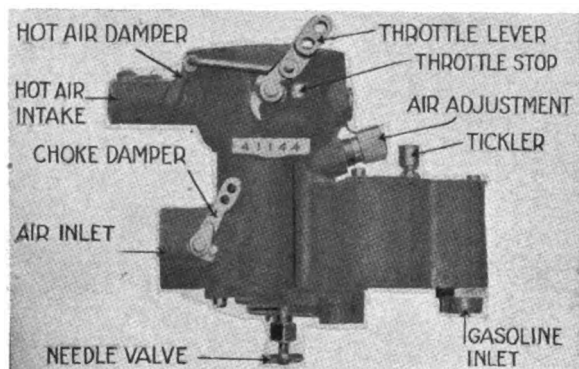
As the maximum capacity of the plant is now 2000 cars a day, it seems evident that the company is suffering from the same difficulty that effects other makers—that is, the inability to get all the parts and material it desires. Nevertheless, this year's production is said to be $66\frac{2}{3}$ per cent. greater than in the same period of last year. There is every indication that the production of the year will reach 500,000 cars instead of the 300,000 made last year. This is half the cars made in America, although there are 196 other companies in operation.

A Cadillac eight-cylinder car was recently driven a distance of one mile on a Florida beach at the rate of $37\frac{4}{5}$ seconds, or 95.2 miles per hour. This event took place at a convention of Cadillac dealers at Jacksonville, Fla.

PRACTICAL FACTS FOR NEW CAR OWNERS.

Elementary Instructions in the Economical Operation, Maintenance, Adjustment and Repair of the New Car—Answers to Inquiries.

THE principle of operation of the Marvel carburetor, model E, does not differ greatly from the principle employed in the several makes



View of the Exterior of the Marvel Carburetor, Model E.

of carburetors already described in the preceding chapters of this discussion. The Marvel carburetor is of the double nozzle type, the auxiliary spray nozzle coming into action only when the engine is operating at high speeds. Its constructional details are also similar. It has the conventional float and mixing chambers, the former being connected with the gasoline supply and the latter to the intake manifold.

The fuel from the supply tank enters the carburetor through the strainer and passes through the float valve into the float chamber. Here it contacts with the cork float. When a predetermined height has been reached the float causes the float valve to close and shut off the flow of gasoline from the tank.

From the float chamber the gasoline flows through a second screen, through a small channel to the needle valve, and then into the spray nozzle. The fuel in the spray nozzle stands at the same height as the fuel in the float chamber.

All air enters the carburetor through one opening, which is at the right hand side. After passing the choke damper it divides, part of it going through the venturi tube around the low speed spray nozzle. The remainder passes to one side and forces the auxiliary valve open. The secondary, or high speed spray nozzle, is located near the top of this valve.

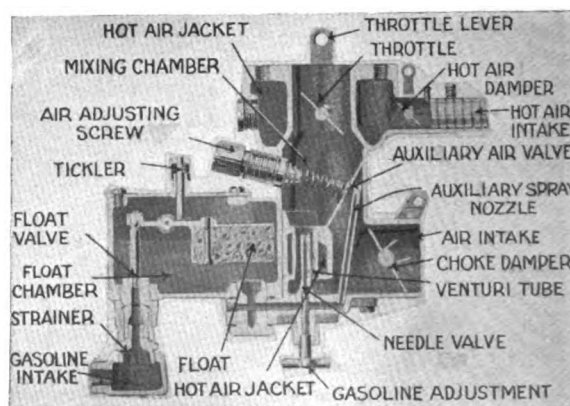
The volume of air drawn through the carburetor is, of course, dependent on the speed of the engine. At low speed practically all the air is taken through the venturi tube. As the engine speed increases when the throttle is opened wider, the proportion increases accordingly and is sufficient to lift the auxiliary air valve from its seat and allow part to enter by this passage.

The rush of air through the venturi picks up and vaporizes gasoline from the low speed spray nozzle and carries it in suspension past the throttle, through the intake manifold and into the cylinders. When suction is great enough to open the auxiliary valve, air passing the auxiliary, or high speed spray nozzle, picks up fuel from this source and carries it into the cylinders in the same manner.

The choke damper in the air intake is intended for use only for starting the motor when conditions are such that a rich mixture is required. Its function is to partially shut off the air supply and allow suctioning of a rich mixture.

To the throttle is connected a hot air damper, which, when open, allows the hot exhaust gasses from the motor to flow through a cored passage around the throttle, where it heats the mixture of gasoline and air. A tube connects this passage with another that surrounds the venturi tube and spray nozzle. This arrangement provides heat for the incoming fuel and air.

Turn the needle valve at the bottom of the



Sectional View of the Marvel Model E Carburetor.

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MAGNETOS

have been adopted as standard equipment by the great ignition experts of

108 Manufacturers

—the largest in the country—including

72 TRUCKS
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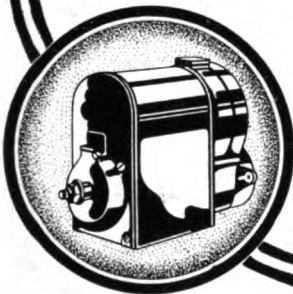
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carburetor to the right until it is completely closed and turn the air adjustment screw to the left until it stops. Next give the air adjusting screw three complete turns to the right and open the needle valve about two complete turns to the left. Start the motor in the usual manner. Close the throttle until the motor idles and then verify the needle valve adjustment by turning it to the right, a little at a time, until the engine operates smoothly and evenly. Allow the motor to run in this manner until it is thoroughly warm.

Next test the air adjustment, by gradually turning the air adjusting screw to the left until the motor starts to slow down, which indicates that the air valve spring is too loose and the screw should be turned back until perfect operation is obtained.

To test the adjustment, advance the spark lever and quickly open the throttle. Should the motor miss or cause a pop back in the carburetor, open the needle valve slightly by turning it to the left. Do not move the air adjusting screw unless absolutely necessary.

The best possible adjustment is secured when the air adjustment is turned as far as possible to the left and the needle valve is turned as far as

possible to the right, providing that the motor runs smoothly and picks up quickly when the throttle is opened. If the motor runs too fast when the throttle is closed, the small set screw in the throttle stop should be turned to the left. When the condition is the reverse and the motor stops when the throttle is fully closed, turn the set screw to the right.

As the throttle is opened, the hot air damper, which is connected to it by a link, gradually closes. This arrangement permits the greatest volume of hot air to pass through the jackets when the throttle is nearly closed. The position of the hot air damper is indicated at all times by the slot at the end of the damper shaft. By loosening the set screw in the damper lever, this can be set for any desired relation between the damper and the throttle. Under ordinary conditions the hot air damper should be nearly horizontal when the throttle is closed.

Packard Carburetor.

In the Packard carburetor the gasoline flows into the float chamber through a needle valve, which automatically shuts off the supply when the copper float rises to the predetermined height. From here the fluid passes through a nozzle from

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is recommended as such by a majority of the leading car builders. Costs no more than common greases.

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There's no leak proof ring but the **LEAK PROOF** Ring — insist

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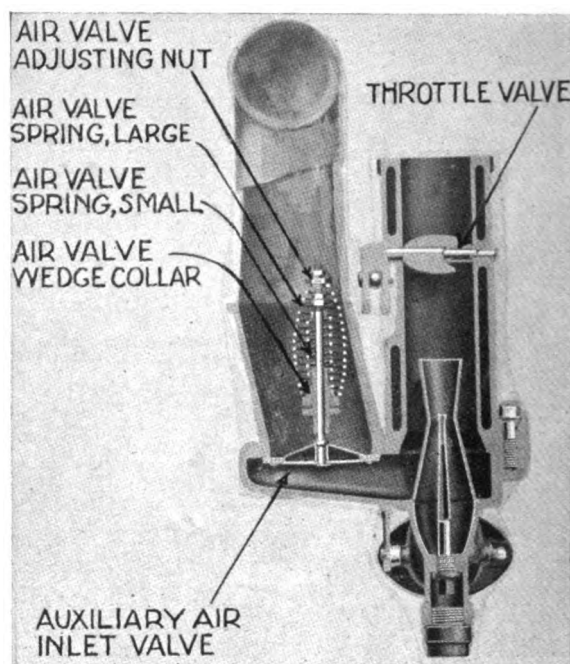
Automobiles

"ASK THE USER"

(When Writing to Advertisers, Please Mention The Automobile Journal.)

which it is sprayed into the mixing chamber. This chamber is cylindrical in shape and is located around and above the spray nozzle. It is surrounded by a water jacket through which warm water passes from the cooling system by a pipe which leads from the water chamber cover. This arrangement maintains a uniform temperature and insures efficiency in mixing the sprayed gasoline with air.

The suction created by the pistons causes air to be drawn into the mixing chamber through both the primary and auxiliary air inlets. Although the primary air inlet is open at all times, the auxiliary air inlet valve is controlled by spring tension, and while the valve opens slight-



Sectional View of the Packard Carburetor, Showing Important Components.

ly at low speed, the vacuum created at high speed opens it still more and thus a greater volume of air is admitted to compensate for the increased supply of fuel. The auxiliary air valve hand wheel on the control board is used only for the regulation of the mixture for starting and to suit the different atmospheric conditions.

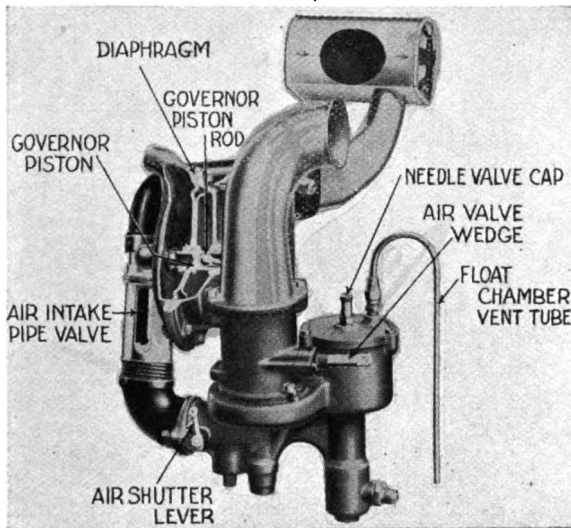
The auxiliary air valve is in a cage on the outer side of the carburetor. It is controlled by two springs, one within the other. The tension is controlled by a wedge underneath the springs and this is connected with and regulated by the auxiliary air valve hand wheel on the control board. Turning the wheel towards "Gas" in-

creases the spring tension and provides a rich mixture, and turning the wheel towards "Air" decreases the spring tension and provides a rare mixture.

The primary air is taken through a heater attached to the exhaust manifold. The proportion of warm and cold air drawn through the carburetor may be regulated by an adjustable sleeve on the primary air intake pipe.

A feature not described heretofore is that the Packard carburetor incorporates a hydraulic governor of the diaphragm type, which prevents the motor from racing when the load is removed. It is operated by the pressure of water in the water circulation system. It consists of a circular chamber divided by a flexible diaphragm of leather and rubber.

On one side of this diaphragm is a water space, which is connected with the water circu-



Exterior and Partial Sectional View of the Packard Carburetor, Showing Governor and Other Details.

lating system. On the other side is an air space and a plunger head against which the diaphragm presses.

This plunger is directly connected with the throttle valve. When a decrease in load on the motor, such as throwing out the clutch, etc., causes its speed to increase, the pressure of the water, circulated by pump, increases proportionally and consequently the diaphragm exerts a greater pressure on the plunger, thus closing the throttle. As the motor speed decreases, the water pressure also decreases and the throttle opens. When the load on the engine increases the action of the governor is just the opposite. The action of the governor is also an indicator of the amount of water in the radiator.

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Made
a clean sweep
in every race of consequence held in 1915—
every one was a Bosch Victory—
no other ignition ever did anything like it because no other ignition method is as reliable or as fast.
Don't experiment, specify Bosch.

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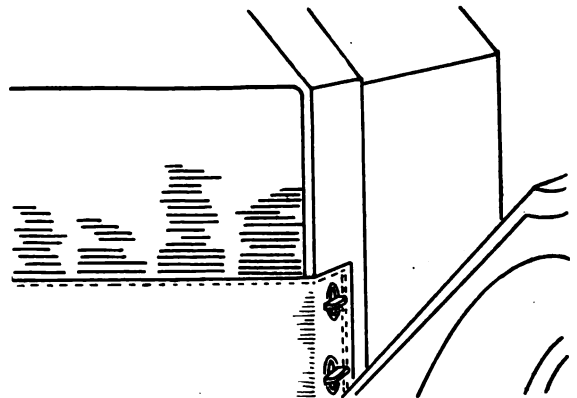

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(When Writing to Advertisers, Please Mention The Automobile Journal.)

How Radiator Covers Should Be Placed, Colors of Pneumatic Tires, Functions of Two Types of Crank Shafts, Principle of Operation of the Multiple Disc Clutch and Several Practical Suggestions.

Covering the Radiator—H. B. S., Saybrook, Conn.
Is it necessary to cover the radiator when operating a car in cold weather? If so, what is the best method?

On late models the use of a cover for the radiator when operating is not imperative, but no doubt operation will be aided by its use. Attachment should be made to the lower part of the radiator, as this is where the cooler fluid settles, due to the law of nature that hot water always rises and cold water settles. This is the principle of the thermo-syphon circulation system. Usually it is sufficient to cover only the lower half of the radiator. Besides protecting the lower



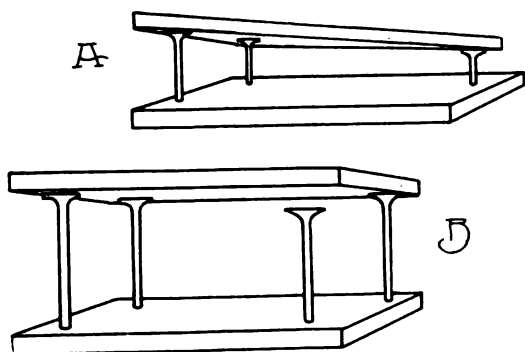
Proper Method of Securing Cover to a Radiator.

fins from the chilling winds, the cold draught is also prevented from striking the carburetor. Although it is common practise to fasten the cover to the fins, it is not generally considered to be advisable because it causes wear at these points. A better plan is shown in the accompanying illustration. Have a metal worker attach to the sides of the radiator four such clamps as are commonly used on automobile tops. An eyelet can then be made in the cover to register with the clamps. The advantage of this arrangement is that the cover may be detached easily on warm days.

Three-Point Suspension—C. A. S., Champaign, Ill.

Having been a subscriber to your journal for a number of years, I would deem it a favor if you would state through your columns the advantage of the three-point suspension over that of four-point. Will you kindly illustrate the three suspension points?

Three-point suspension in motor car design refers to the manner in which the motor is suspended in the chassis. The usual manner is to provide two suspension points at the rear and one at the front, as shown in the accompanying illustration. The advantage claimed for this method over a four or more point suspension is that regardless of the manner in which the frame may be sprung by uneven surface of travel or other conditions, the points of suspension always remain effective without undue strain on the chassis. There are many gears and revolving shafts in the motor, which, if they are to afford long and satisfactory service, must be kept from binding. To illustrate the advantage of this design, drive three nails into a piece of wood and on the nails set a triangular piece of wood. If one nail was driven into the wood farther than the other two the triangular form would still have a solid bearing, as shown at Fig. A. Drive a fourth nail into the base and set a four-sided



Sketch. Illustrating Principle of Three and Four-Point Suspension.

form on the nails. As will be seen at B, the piece will bear on three nails and would only bear on the fourth if strained. Another example is to compare two types of milking stools, one having four legs and the other three. If the floor is uneven the stool with four legs will rest on but three, while the one having three legs maintains equilibrium regardless of the level of the floor.

Colors of Tires—R. F. D., Methuen, Mass.

Has the color of the rubber used in automobile tires any determining value in mileage? Is a gray tire better than a black one?

This subject is often discussed by motorists, and the following statement, offered by one of the leading tire authorities in this country, P. W. Litchfield, factory manager of the Goodyear Tire and Rubber Company, will be found to possess much value:

Pure rubber, as it is tapped from the tree, is a creamy

(When Writing to Advertisers, Please Mention The Automobile Journal.)

No More Ignition Troubles—

Stop that excessive waste of gas and current—stop experimenting with cheaply-built, easily breakable spark plugs that cause endless trouble and expense. Get more power and speed—enjoy long, efficient, care-free ignition service by equipping your engine with the quality spark plugs of the world—MASTERS!—the plugs that insure swift, uniform, thorough combustion.

MASTER SPARK PLUGS

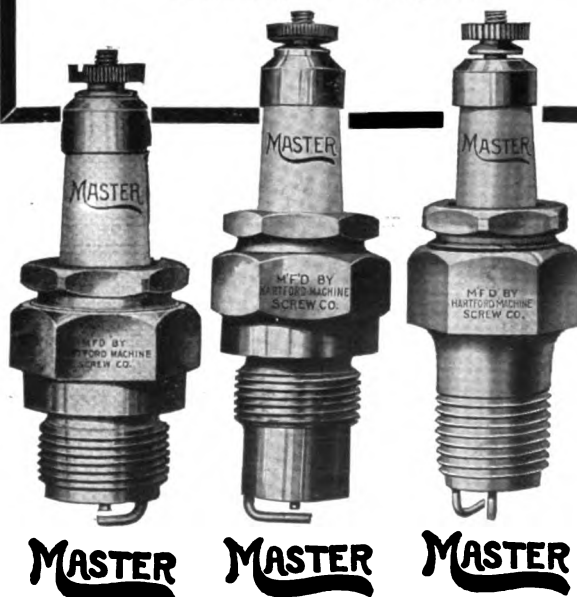
—represent the utmost in scientific spark plug construction. Will not break, soot or leak gas. Strong—substantial—easily cleaned. So simple they can be easily taken apart and put together with no resulting injury.

There is a MASTER to suit every make of car—one that will give you unheard of spark plug satisfaction. Try a set on our “30 days’ money-back” guarantee.

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Regular Length
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Model F, designed especially for Ford Cars, \$1.25 Each.

The Quality Car



1916 Model
Metz "25" Roadster

METZ

"25" Roadster, 1916 model. Price \$600, completely equipped. Built on same chassis as Touring Car, with 108-

inch wheel base and carries identical equipment, including electric starter and electric lights, 25-horse power water-cooled motor, large wheels and tires, rain vision wind shield, instant one-man top, speedometer, built-in gasoline gauge, signal horn, etc. A wonderful hill climber, and for reliability in road performance is absolutely unsurpassed. Write for DEALER particulars and new illustrated catalog "Q."

NOTE—The Metz "25" Touring Car, 1916 model, completely equipped as above described, is also listed at \$600.

METZ COMPANY, WALTHAM, MASS.

white liquid. Frequently it is coagulated to retain this color, but more often it is smoked, which produces a transparent brownish color. Rubber when used for commercial purposes must be vulcanized with sulphur. If the rubber is pure and contains nothing but sulphur, it will be of a grayish color after vulcanized, but if stretched into thin sheets and held to the light, it will be almost transparent and of a pale brown or creamy color. Any other color than this is produced only by the addition of various chemical substances, usually to toughen and afford it additional wearing qualities. Many times chemical adulterants are used with no other virtue than to cheapen it. A pure white color is generally produced by the addition of oxide of zinc. This has long been recognized as an excellent toughener of rubber and is extensively used in the manufacture of automobile tire treads.

Black is usually produced by the addition of lamp-black, or some organic chemicals. Reds are the result of the addition of antimony or oxides of iron. Formerly, the majority of tires were gray, produced by the combination of lead and zinc oxide. The discovery of new materials to replace lead made possible the production of the tough white stocks. The European war has had the effect of decreasing the supply of the oxide of zinc and the imported product has increased in price over 400 per cent. Even at this price there is practically none obtainable. The American made oxides have also increased in price, but there is not a sufficient supply to meet the requirements of the trade. This shortage necessarily has limited the supply of white rubber considerably.

The rubber should not be judged by the mere color, however, as this is not proof of its quality. Both tough and poor wearing stocks can be made in any color desired. The quality of a tire should be compounded on a basis of service and mileage, rather than color.

Thermostats in Cooling System—F. B., Fairhaven, Mass.

I am informed that there is some arrangement in the cooling system of the eight-cylinder Cadillac to allow the temperature to rise rapidly when the motor is cold. Will you please describe the principle of the arrangement?

Thermostats are used in the Cadillac eights to cause the water circulated through the jackets of the cylinders and carburetor intake manifold to rise quickly to a temperature by which the most satisfactory operation is obtained. The thermostats control valves are located between the radiator and the water pumps. Should the water around the engine be below a predetermined point the valves remain closed. The water is only then circulated through the water jackets of the cylinders and carburetor intake manifold. It is obvious that only having a comparatively small area to travel, the water will be heated quickly. When the temperature tends to rise above the predetermined point, the valves open and allow the pumps to draw water from the radiator. Only enough water is drawn from that source to prevent the water around the engine from rising above the predetermined point.

The Crankshaft—H. H. B., Centredale, R. I.

I was surprised to notice in a local repair shop the difference in construction between a one-cylinder motor and one from a motor of four cylinders. The one-cylinder type had what appeared to be a weight attached to it. I inquired as to the need of this, but could not obtain a satisfactory reply. Neither could I learn how the shafts are made. Can you make these points clear to me?

The crankshaft, also termed the mainshaft, communicates power from the motor to the driv-

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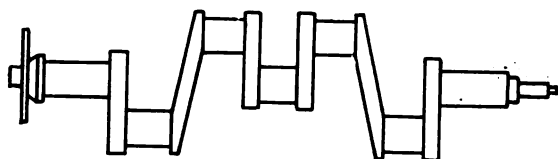
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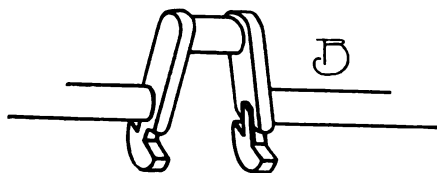
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ing assembly of the car. The manner in which the shaft is made depends upon the grade of car in which it is to be used. Those used in the highest priced cars are cut from a solid block of special alloy steel, which requires much time and much waste of stock. The majority of crankshafts are drop forged and then machined to size. These are made of a high-grade of carbon steel.

The number of crankpins formed on the shaft depends, of course, upon the number of cylinders used in the motor. Perfect balance is the secret of the well running motor. It will be seen at A, in the accompanying illustration, that the shaft is self-balancing, as there are an equal number of crankpins on both sides. However, this is not the case with the crankshaft designed for the one-cylinder motor, as this type of engine requires the use of but one crankpin. This arrangement would cause the shaft to be out of balance and result in a pounding motor were it not for the weight attached to the crankshaft at a point opposite to the



A



B

Difference in Construction of One and Multiple Cylinder Motor Crank Shafts.

crankpin. This arrangement is shown at B.

When crankshafts have been machined to within a few thousandths of an inch of the desired size, they are carefully ground to fit the bearings for which they are intended. Whether the shaft be cut from a solid piece, or drop forged, it is always subjected to a special heat treatment so as to afford it the proper strength.

Hollow crankshafts are now being constructed to reduce the weight of the part and to afford an easy means for supplying oil to the various bearings. Regardless of the number of cylinders used the gasoline engine never has more than one crankshaft.

Multiple Disc Clutch—J. A. C., Willows, Cal.

I have just purchased a second-hand car that has a multiple disc clutch. Will you explain the function of this part and also the general working principle?

Its purpose is to connect the transmission

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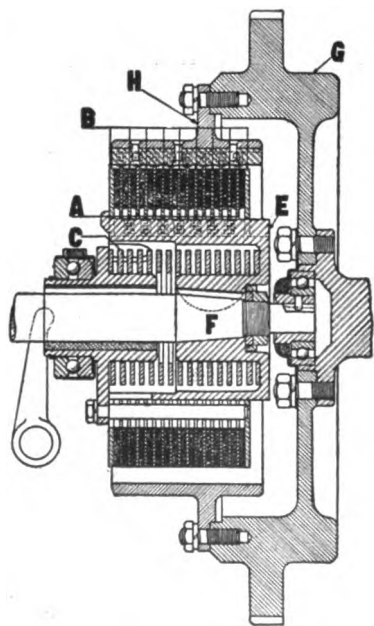
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shaft to the motor. Unlike a coupling, which provides a permanent joint, the clutch also serves the purpose of freeing the transmission from the



Sectional View of a Multiple Disc Clutch.

The driving discs, A, are faced on both sides with friction material. These plates are driven by six keys in the clutch ring, H, which is bolted to the engine flywheel, G. The driven discs, B, are not faced with friction material and are carried on the clutch hub, E, and drive it through six keys on the hub. The clutch hub is permanently keyed to the transmission shaft, F. It will be seen in the sketch that driving and driven discs are alternately arranged. When the clutch is engaged, the strong coil spring, C, compels all discs to contact with each other and the resulting friction between the driving discs and the driven discs compels the transmission shaft to rotate. The latter, of course, drives the gears in the transmission.

CLEANING RADIATOR.

A motorist who makes many of his own repairs suggests the following method for cleaning the circulating system of the automobile: Dissolve one pound of sal-ammoniac in water and pour the mixture into the radiator. Allow it to remain in the system for about two days, during the usual operation of the car, and then drain off and flush with clear water. If any chemical action takes place while the sal-ammoniac is in the system, it will be indicated by an odor like ammonia.

engine. The accompanying illustration shows the multiple disc clutch used in a popular car.

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ELECTRIC WARNING SIGNALS.

While the mechanism of an electric warning signal may appear complicated to the laity, it is really quite simple when one grasps the principles upon which operation is based. Two types of horns are shown in the accompanying illustration. That shown at Fig. 1 is based upon the rapid oscillations of an armature attracted by an electro magnet, which actuates the diaphragm by a plunger rod, shown at A. The attraction of the armature B by the magnet brings it in sharp contact with the plunger and distorts the surface of the disc. At the same instant the contact at the points is broken and the current is interrupted. This allows the armature to spring back against the platinum point, because the magnet ceases to have attraction for it. As the points come together the circuit is resumed and the action described above is repeated. The cycle of operation is completed so quickly that several hundred take place within the space of a minute, which results in what seems to be a continuous note, whose intensity depends upon the rapidity of oscillation.

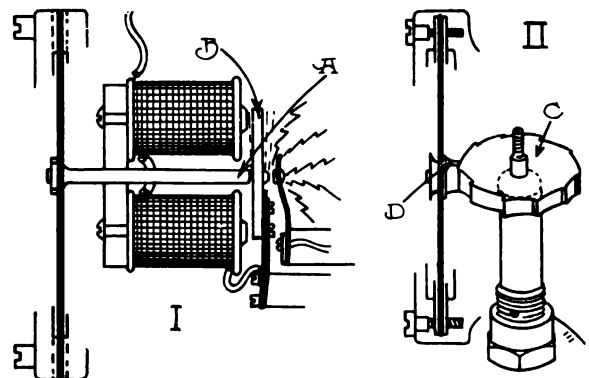
The type of horn shown at Fig. 2 is based upon a mechanical principle. A small ratchet wheel, indicated by C, is driven by a motor in the

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base of the instrument to actuate upon a hardened steel button, shown at D, which is attached to the centre of the disc.

LOCATING LEAKY CYLINDER.

When water is leaking from a cracked water jacket into the cylinder, it is often a difficult task



Details of Construction and Operation of Electric and Mechanical Warning Signals.

to determine the fault. A simple but positive method is to fill the cooling system with water until the fluid is at the mouth of the overflow pipe in the radiator. Turn the motor over by



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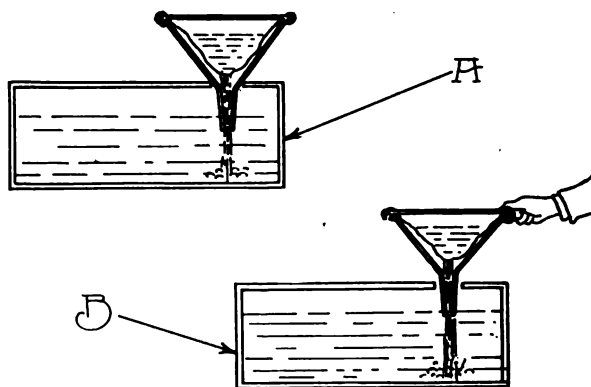
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hand, noting in which cylinder compression appears. For example, if the piston is compressing the charge in the No. 1 cylinder and the water starts to flow into the overflow pipe, it is proof that this cylinder is the leaky member. The reason for this is that the gas and water in the cylinder are forced through the crack and cause the water in the system to rise.

DANGER LURKS IN CHAMOIS STRAINER.

Death, or at least serious and painful burns, lurk in the practise of straining gasoline into the storage tank through a chamois skin. This is the gist of an article in the October issue of the Timken Magazine, the house organ of the Timken-Detroit Axle and the Timken Roller Bearing companies.

The foundation for the statement is that gasoline and chamois are incompatibles, and under certain conditions contain potentialities that cre-



The Correct and Incorrect Method of Filling the Gasoline Tank.

ate powerful explosions. When the gasoline is seeping through the chamois laid in a funnel as a strainer static electricity is generated, and the funnel becomes charged with it. Static electricity, it might be explained, has been defined as electricity at rest, and when not disturbed is neither beneficial nor destructive. However, when the conditions are propitious, it becomes one of the most diabolical physical agents known, a force that destroys with the speed of lightning.

All is well as long as the funnel fits snugly in the mouth of the tank, thus forming a ground; but if the funnel is raised slightly, or a slight gap exists, then the static electricity leaps across the gap, forms a spark and ignites the gasoline vapor rising from the tank. Scores of motorists have been seriously, and many fatally, burned by the resulting explosion.

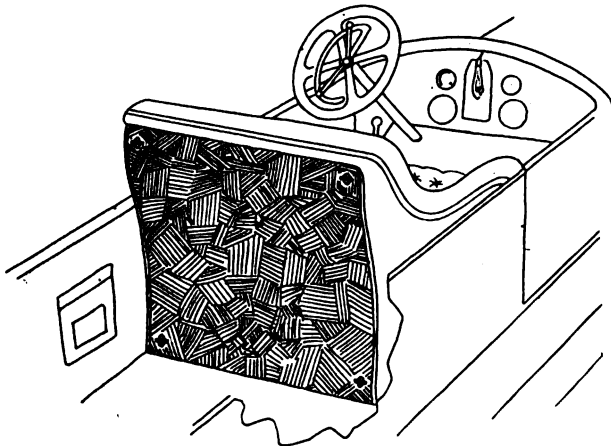
In view of this it is best not to use chamois as

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a strainer. If it must be used make absolutely certain that the funnel fits snugly so that there is a ground. Sketch A on page 78 illustrates how the funnel should set, and sketch B the way it should not be held.

BODY PANEL SHIELD.

Many persons when riding in the tonneau of a car place their feet against the back panel of the front seat and usually mar the fine paint and varnish finish. A simple cover to protect the panel is shown herewith. Cut a fabric shield, preferably of felt, to conform with the shape of the panel. Curtain fasteners can be obtained from any trimmer's shop and these should be fitted to the top and bottom of the shield. The retaining hooks should, of course, be screwed into the body. If desired the shield can be made ex-



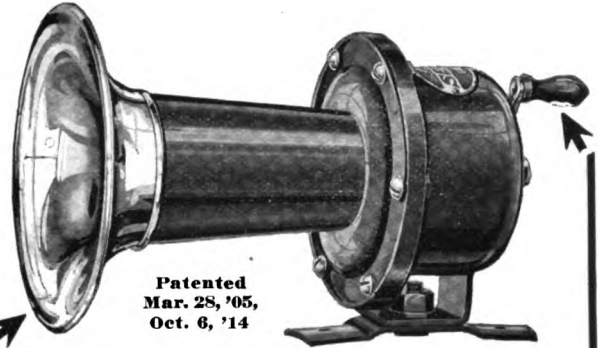
Practical Way to Protect the Finish of the Front Seat Panel.

tra long, so that it may be unfastened from the bottom to serve as a lap robe in stormy weather.

GEAR LUBRICATION.

Thick grease, or heavy oil, should not be used in the gear boxes at this time of year, as the low temperature causes them to adhere to the sides of the case, in which case little if any of the lubricant reaches the gears. This circumstance produces noisy operation and excessive wear. A suitable lubricant can be made by mixing flake graphite with light cylinder oil. If the thick grease cannot be readily removed from the case, a mixture of kerosene and cylinder oil should be added.

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Index to Advertisers.

	Page
Ahlberg Bearing Company.....	57
American Chain Co., Inc.....	55
Barrett Manufacturing Co.....	59
Bosch Magneto Company.....	57
Coes Wrench Co.....	3
Culver-Stearns Mfg. Co.....	60
Dixon Crucible Co., Jos.....	58
Dover Stamping & Mfg. Co.....	56
Du Pont Fabrikoid Co.....	61
Eagle Oil and Supply Co.....	2
Eisemann Magneto Co.....	53
Gulf Refining Co.....	63
Hartford Machine Screw Co.....	55
Hartford Suspension Co.....	57
Heinze Electric Co.....	56
Inter-State Motor Co.....	55
Mansfield Mfg. Corp.....	63
Marburg Bros.....	56
McQuay-Norris Mfg. Co.....	58
Mea Magneto Co.....	56
Mecca Mfg. and Spec. Co.....	2
Metz Company.....	60
Milwaukee Auto. Spec. Co.....	55
New Departure Mfg. Co.....	56
N. Y. & N. J. Lubricant Co.....	58
Nordyke & Marmon Co.....	59
Peerless Motor Car Co.....	60
Royal Typewriter Co.....	7
S. J. R. Motor Co.....	63
Scripps-Booth Co., The.....	10
Splitdorf Electrical Co.....	Cover
Springfield Metal Body Co.....	9
Staybestos Mfg. Co., The.....	62
Superior Mfg. Co.....	60
Texas Oil Company.....	59
Thermoid Rubber Co.....	57
Times Square Auto Co.....	2
Tuttle & Bailey Mfg. Co.....	5
Valvoline Oil Company.....	59
Vanderpool Co., The.....	2
Wadsworth Mfg. Co.....	59
Willys-Overland Co.....	Cover
Winton Company, The.....	1
Zenith Carburetor Co.....	Cover

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Carleton Co., The, 172 Summer St., Boston. (New Carleton No. 68.)

Culver-Stearns Mfg. Co., Worcester, Mass.; Detroit.

Disco Electric Starter Corp., Detroit, Mich.

ELECTRIC TROUBLE SHOOTER.

American Bureau of Engineering, 1526 Wabash Ave., Chicago, Ill. (Ambu.)

ENGINES, GAS, GASOLINE, KEROSENE.

Manufacturers' Engine Company, Kansas City, Mo.

FILLOMETER.

Apex Electric Co., 1410 West 59th St., Chicago, Ill.

FIRE EXTINGUISHERS.

Pyrene Co. of N. E., 88 Broad St., Boston, Mass.

FORD HOODS AND RADIATORS.

Superior Lamp Mfg. Co., 136 W. 52nd St., New York, N. Y.

FORD STARTERS.

Hunter Auto Supply Co., Hunter Bldg., 325 W. Madison St., Chicago, Ill. (Hunter.)

Picard, A. J., & Co., 1720 Broadway, New York City. (Genemotor.)

Walden Mfg. Co., 73 Commercial St., Worcester, Mass.

FOUR WHEEL DRIVE.

Four Wheel Drive Auto Co., Clintonville, Wis.

FUNNELS, AUTO.

Dover Stamping & Manufacturing Co., Cambridge, Mass. (Dover.)

GARAGE COMPRESSOR.

Jacobson Mch. Mfg. Co., Warren O. (Mascot.)

GAS ENGINES.

Manufacturers' Engine Company, Kansas City, Mo.

GASOLINE ENGINES.

Manufacturers' Engine Company, Kansas City, Mo.

GEAR SETS.

Detroit Radiator Specialty Co., 961 Woodward Ave., Detroit, Mich.

GEARS, STEERING.

Ross Gear & Tool Co., 794 Heath St., Lafayette, Ind. (Ross.)

GENERATORS.

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HEATERS.

Superior Mfg. Co., N. S. Pittsburg, Penn. (Superior Safe Garage.)

HORNS.

Faw, J. H., Inc., 41 Warren St., New York City. (Clero.)

Fitzgerald Mfg. Co., 101 Oliver St., Torrington, Conn. (Clero.)

Sells Mfg. Co., 444 Dorr St., Toledo, O.

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Faw, J. H., Inc., 41 Warren St., New York City. (Ideal.)

IGNITION ASSEMBLIES.

Faw, J. H., Inc., 41 Warren St., New York City.

INSULATION.

Packard Electric Co., The, Warren, O.

JACKS.

Motor Specialties Co., Waltham, Mass. (Excel Auto.)

KEROSENE ENGINES.

Manufacturers' Engine Company, Kansas City, Mo.

LAMPS.

Faw, J. H., Inc., 41 Warren St., New York City.

Mabey's Electric & Mfg. Co., Indianapolis. (Mabey's Electric Trouble.)

Mueller & Co., E. S., 431 High Ave., S. E., Cleveland, O. (Clamp.)

LIGHTERS, CIGAR.

Mabey's Electric & Mfg. Co., Indianapolis. (Mabey's Electric.)

BUYERS' REFERENCE and GUIDE—Continued.**LIGHTING SYSTEMS, ELECTRIC.**

Carleton Co., The, 172 Summer St., Boston. (New Carleton No. 68.)

Faw, J. H., Inc., 41 Warren St., New York City. (Culver Stearns.)

Hawthorne Mfg. Co., Inc., 5 Spruce St., Philadelphia, Penn. (Spotlights, Marine Searchlights, Pencil Flashlights.)

Xcel-O-Lyte Co., 1200 Xcelo Bldg., Newton, Ia.

LIGHT PROTECTORS.

Faw, J. H., Inc., 41 Warren St., New York City. (Lennon.)

LUBRICANTS.

Dixon Crucible Co., Jea., Jersey City, N. J. (Graphite.)

Eagle Oil & Supply Co., 104 Broad St., Boston. (Eagleline No-Karbon.)

New York & New Jersey Lubricant Co., 165 Broadway, New York. (MotoRol, Non-Fluid, Kejex.)

Standard Oil Co., New York. (Polarine.)

Texas Company, 17 Battery place, New York City. (Texaco.)

Valvoline Oil Co., 27 State St., Boston. (Valvoline.)

MAGNETO COVERS.

Heinze Electric Co., Lowell, Mass.

MAGNETOS AND SUPPLIES.

Bosch Magneto Co., 204 W. 46th St., New York.

Eisemann Magneto Co., 32 33d St., Brooklyn, N. Y. (Eisemann.)

Marburg Bros., 1790 Broadway, New York. (Mea.)

Splitdorf Electrical Co., 98 Warren St., Newark, N. J.

MAILING LIST.

Trade Circular Addressing Co., 166 W. Adams St., Chicago.

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Wilmo Co., 208 So. La Salle St., Chicago, Ill.

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Waukesha Motor Co., Waukesha, Wis.

Wisconsin Motor Mfg. Co., Milwaukee, Wis.

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Boston Blacking Co., Boston, Mass.

PAINTS.

Boston Blacking Co., Boston, Mass.

PISTON RINGS.

Featherweight Piston Company, 11 Guyman Way, Pittsburg, Penn.

McQuay-Norris Mfg. Co., Dept. D, St. Louis, Mo. (Leak-Proof.)

PISTONS, ALUMINUM ALLOY.

Featherweight Piston Co., 11 Guyman Way, Pittsburg, Penn.

POLISHES.

International Metal Polish Co., Indianapolis, Ind.

PRESSES. (See Arbor Presses.)**PUMPS, VALVE.**

Hill Pump Valve Co., Chicago, Ill.

RADIATOR CEMENT. (See Cements.)**RADIATOR & HOOD COMBINATIONS.**

Superior Lamp Mfg. Co., 136 W. 52nd St., New York, N. Y.

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Rome-Turney Radiator Co., Rome, N. Y. (Helical Tube.)

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Harding Distributing Co., Boston. (Martell Aligning.)

REBORING CYLINDERS.

Motorcycle Accessories Co., St. Paul, Minn.

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Heinze Electric Co., Lowell, Mass.

Milwaukee Auto Specialty Co., 706-711 Chestnut St., Milwaukee, Wis. (Centerfire.)

Splitdorf Electrical Co., 98 Warren St., Newark, N. J.

Superior Motor Power Company, 24 Irving Place, New York City.

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International Metal Polish Co., Indianapolis, Ind.

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THERMOS CASES.

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TIMERS.

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TIRE CHAIN GRIPS. (See Chains.)**TIRE PUMPS.**

Detroit Motor Acc. Mfg. Co., 975 Woodward Ave., Detroit, Mich. (Gearless Motor Driven.)

TIRE REPAIR OUTFIT.

C. A. Shaler Co., 252 Fourth St., Wau-pun, Wis.

TIRES, CASINGS AND INNER TUBES.

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Springfield Metal Body Co., 20 Medford Ave., Springfield, Mass.

TRACTORS.

Knox Motor Associates, Springfield, Mass. (Knox.)

TRANSFORMERS.

Packard Electric Co., The, Warren, O.

TRUCKS AND TRACTORS. (See Cars, Commercial.)**VALVE GRINDING COMPOUND.**

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Mabey's Electric & Mfg. Co., Indianapolis. (Mabey's Electric.)

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Seiss Mfg. Co., 444 Dorr St., Toledo, O.

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Searchlight Co., 1012 Karpen Bldg., Chicago, Ill.

Waterhouse Welding Co., 3 Pelham St., Boston, Mass.

WRENCHES AND COMBINATION OUTFITS.

Coe Wrench Co., Worcester, Mass.

Faw, J. H., Inc., 41 Warren St., New York City. (Walden.)

Lane, Will B., 180 No. Dearborn St., Chicago. (Unique Ratchet.)

Moesberg Co., Frank, Attleboro, Mass.

Walden Mfg. Co., 73 Commercial St., Worcester, Mass.

NEW YORK

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VOL. XL

JANUARY 10, 1916.

NO. 11.

PUBLISHER'S AND READERS' PAGE.

BEGINNING Jan. 1, all owners and drivers of cars in Massachusetts were required to have the head lamps of the machines they control conform to the law that on that day became effective. The purpose of this statute is to better safeguard the public by requiring that the rays of the lamps be so directed that they shall make all objects plainly discernible, both in the path and at either side of the machine, and at the same time shall not blind those who are exposed to them. There is no intention of materially lessening the value of the light, but to the contrary, so direct it that there shall be no danger, or at least much less danger than there would be with the ordinary motor car lamp equipment. This policy is safe and sane, and there is no reason why there should be remonstrance by motorists, for when lamps have been adapted to the required conditions they will always serve.

Motor Car Development was never so well demonstrated as by the New York automobile show. The exhibition was practically one of stock machines, such as may be purchased anywhere in the United States at list prices, and there was no endeavor made to display special vehicles in the sense of unusual finish and equipment. At the exhibition was seen cars that represented more actual value than were ever previously displayed, and in contrast with previous shows the progression made has been little short of marvelous. The cars of today, from the smallest to the largest, from the lowest to the highest priced, are really

wonderful so far as engineering is concerned, adapted for any purpose, and so economical of operation that there is apparently no reason why any other vehicle should be used in preference to them.

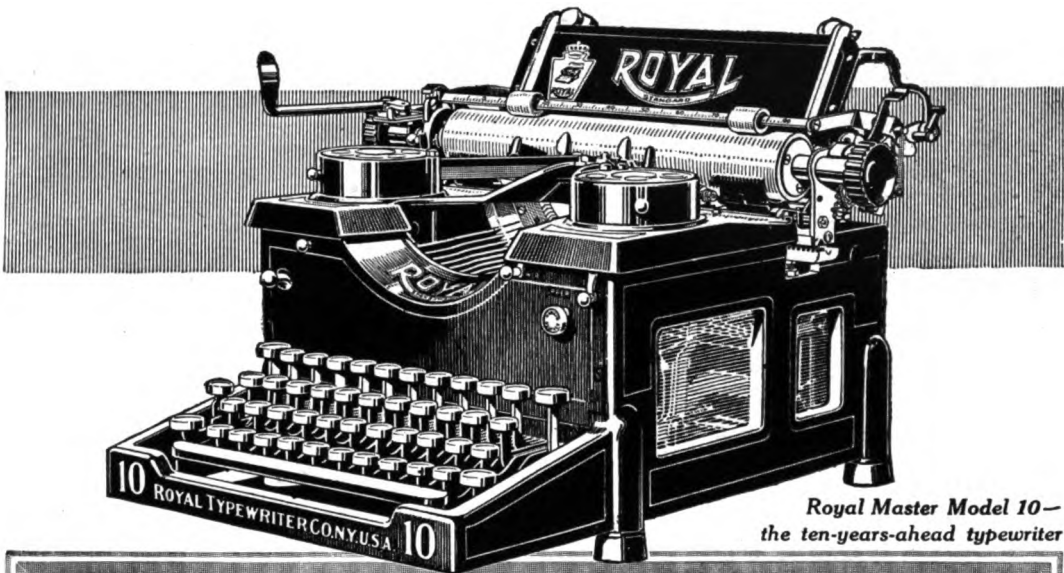
The Road Building policy of the different states of the nation, while not as well formulated and concentrated as might be desired by those who have been active in the promotion of highway improvement, is undeniably progressive, and each year there is greater interest by the citizens and more liberality manifested so far as providing funds with which to carry on this work. There is now about 10 per cent. of the roads of the country improved to a greater or lesser degree, and the cost of maintenance of these highways will be increased annually if they are to be kept up to a standard condition. This is separate and apart from new work, for which considerable increase will be necessary if the betterment is to continue.

The Publisher announces that beginning with the Feb. 25th issue, which will be the Boston Show Number, the type page of this magazine will be enlarged to what is known as the standard magazine size—7½ by 10 inches. This will increase the area of the page 30 per cent., and afford the advertiser better opportunity for display, and it will be more satisfactory to the reader because of the greater possibility for attractive typographical makeup. This is in keeping with the policy for consistent improvement. Despite this increase there will be no decrease in number of pages.

Partial Table of Contents.

	Page
*New York Show Review.....	11
Custom Cars at Salon.....	14
*Features of the Exhibits.....	15
*Changing Emphasis of Design.....	17
*News Announced at the Show.....	19
*Demonstration of Hartford Brake.....	21
*Record Show at Chicago.....	22
Massachusetts' New Headlight Law...	24
*General News of the Industry.....	25
*Suggestions for the Ford Car Owner..	29
*Details of the Abbott-Detroit 6-44.....	33
*Two Winton Sixes for 1916.....	36
*Practical Motor Car Repairs.....	39
*Motor Starting and Car Lighting.....	43
*Industrial Happenings and Comments..	48
*Car Accessories and Equipment.....	49
*Practical Facts for New Car Owners...	52
*Answers to Inquiries.....	56

*Indicates that article is illustrated.



Royal Master Model 10—
the ten-years-ahead typewriter

Why Big Business chooses the Royal

"Big business" is big because it is organized and managed for tomorrow, and next year and years ahead.

"Big business" buys and uses Royal Typewriters—to *keep*.

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Big business knows the *time lost* when operators have to "fight" their machines.

Big business knows that the Royal is *instantly* adjusted to the *personality* of the operator, that the Royal has *long life* built into it, that the Royal does *all* a typewriter should do—

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It won't take more than a few minutes to see the Royal and to let it be demonstrated. That's the quickest way to get facts. Write us, or telephone our nearest branch or dealer today.

ROYAL TYPEWRITER COMPANY, INC.

Factory, Hartford, Conn. 12 Royal Typewriter Bldg., Broadway, New York

Branches and Agencies the World Over

(When Writing to Advertisers, Please Mention The Automobile Journal.)

BOSTON MOTOR TRUCK SHOW

March 4-11, 1916

THE BOSTON SHOW EDITION OF MOTOR TRUCK

Will Be Mailed February 25

The Boston Exhibition will be the only show of motor trucks of national importance of the year.

The entire section of the country from which this show will attract visitors is covered by the ***Motor Truck*** practically to the exclusion of all other publications devoted to highway transportation.

Publicity in this edition will reach every interest, it will be complete publicity for one expenditure, and circulation will not be duplicated.

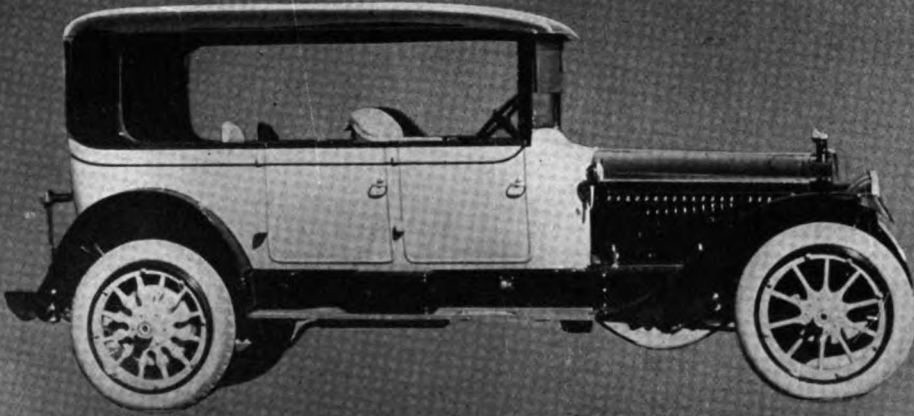
The last form will close February 21.

THE MOTOR TRUCK

TIMES BUILDING

PAWTUCKET, R. I.

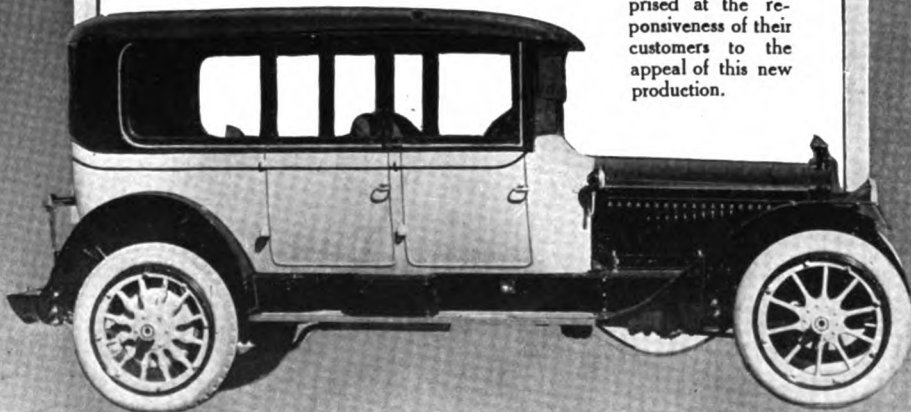
SPRINGFIELD CONVERTIBLE BODIES



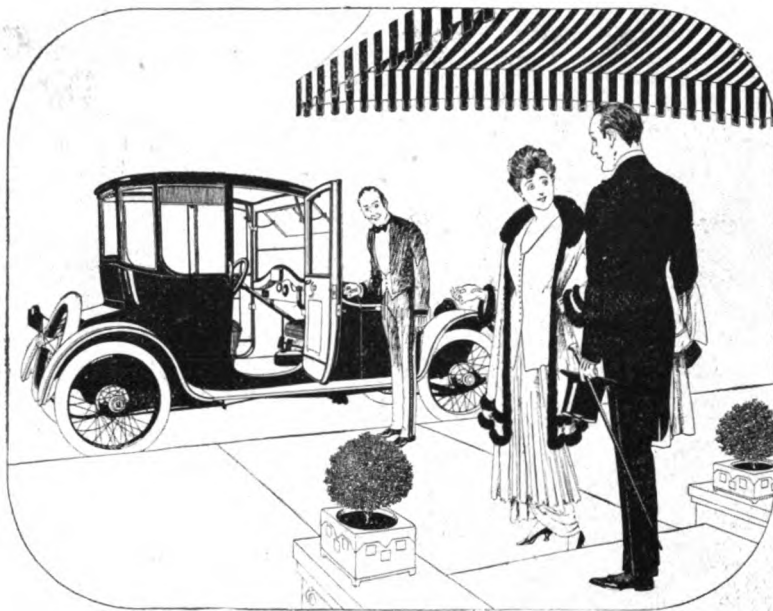
THE limousine and the touring car are completely satisfactory only in certain seasons. The new Springfield Demi-Convertible body has no such limitations; it is the all-year, all purpose body.

More and more in America, as in Europe, the tendency is to demand protection from the sun, the dust and sudden showers even in touring. This body with its permanent top provides such protection, while it gives plenty of air and an unobstructed view. It may be converted into a limousine.

Dealers will be surprised at the responsiveness of their customers to the appeal of this new production.



SPRINGFIELD METAL BODY Co.
SPRINGFIELD, MASS.



Luxury

LUXURY is a relative sensation, judged only on the basis of previous experience. To the poor, luxury is relief from discomfort; to the rich, it is their sensation of greater comfort. Only those used to comforts can be connoisseurs of luxury.

Newport and Ocean Avenue, New York and Riverside Drive, Chicago and Sheridan Road all contain Scripps-Booth after-purchase enthusiasts, who are enjoying new pleasures in owning and driving Scripps-Booth cars.

The message to you of this fact needs no explanation.

ROADSTER	\$775
COUPE	\$1450



Scripps-Booth Company
Detroit, Mich.

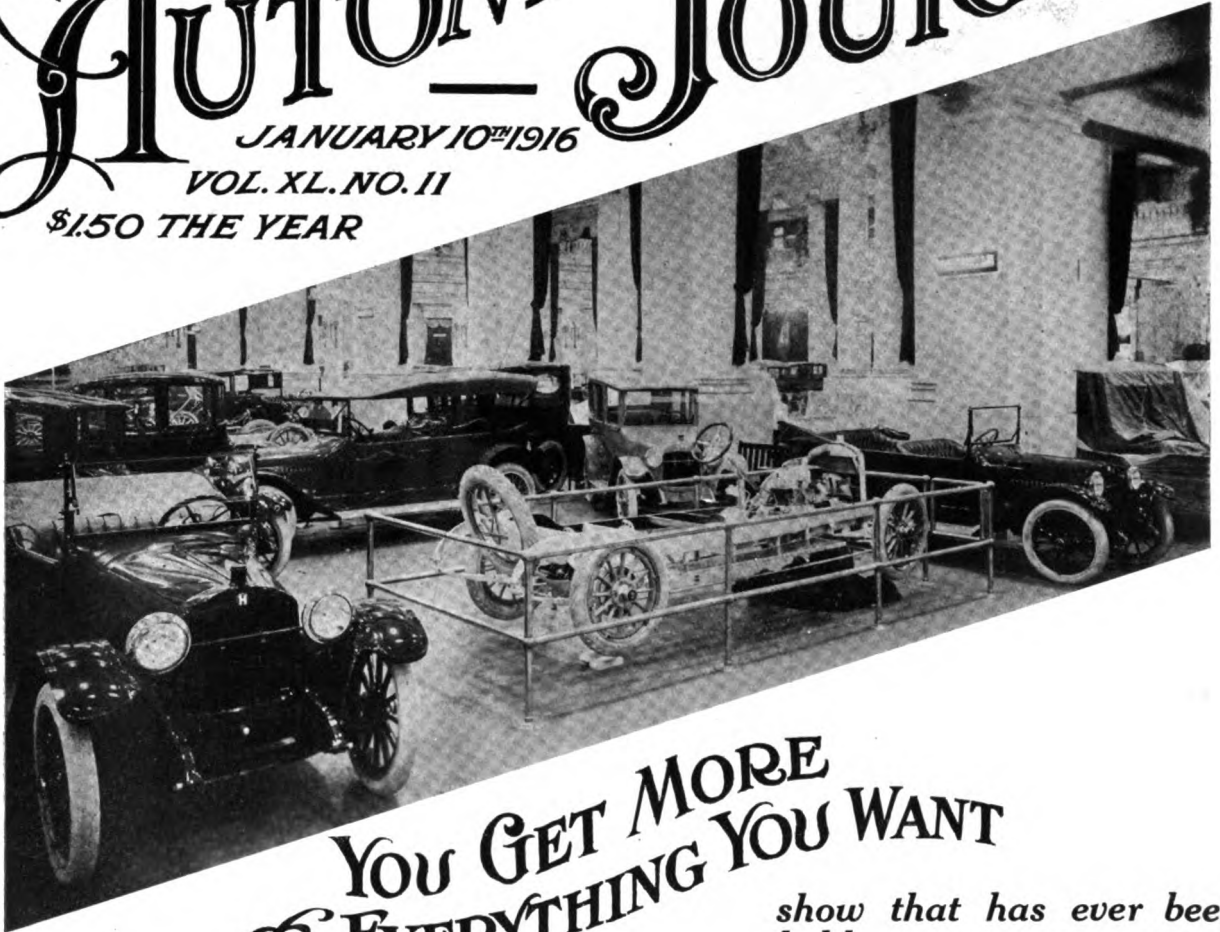
(When Writing to Advertisers, Please Mention The Automobile Journal.)

The — AUTOMOBILE — JOURNAL

JANUARY 10TH 1916

VOL. XL. NO. II

\$1.50 THE YEAR



**YOU GET MORE
OF EVERYTHING YOU WANT**

**THE NEW YORK
SHOW** was the most
successful that had ever
been held.

*The attendance
was bigger, the sales
larger, the interest
greater than at any*

WHATEVER a motorist de-
sired in a car or what-
ever price he wished to pay he
found his wants satisfied in
greater measure than ever be-



*A Scene
Through the Pil-
ars on the Main Floor.*

*show that has ever been
held.*

*There was a greater
variety of new things in
both mechanical and body
design than has been shown
in many years.*

*Throughout the dis-
play more value was of-
fered for the money than
ever before.*

fore among the exhibits in the bril-
liantly lighted and handsomely decora-
ted Grand Central Palace during the
16th annual show.

If his search was for a serviceable



Premier Touring Car-One
of the New Boat LineTypes

car at the lowest necessary price, he found a better car this year at a lower price. The millionaire looking for the utmost in motor car

perfection can this year get more perfection than ever before at about the same or a lower price. The man who desires a thoroughly handsome and convenient car, but still must consider price, can get greater satisfaction for less money.

The newly developed advantages of the cars in the price class above \$1000 are many, and they affect almost every phase of motoring. The stream line and boat line types of body are now handsomer and more pleasing than ever. Many of them are of the extremely attractive, although still slightly radical double cowl design.

These cars will be found, with few exceptions, to have been provided with the aisleway between the front seats, which adds immeasurably to the convenience of the passengers. This design has been accompanied in many instances by a reduction in the number of doors to two or even one.

A secondary development of the divided front seat are the many clover leaf roadsters. In these the aisleways lead to an additional compartment behind the two front seats, where one or two additional seats are arranged. This is the most compact and companionable type of body that has ever been built. Many manufacturers emphasize that fact by calling the roadster "Chummy" or "Clubby."

In the seven-passenger types the disappearing auxiliary seat is now practically standard. In some examples of

this design the seats disappear into the back of the front seats; in others, they disappear into the floor.

The cars in this class display great progress in mechanical design. It is here that the eight and the 12-cylinder models are found. These designs have almost banished motor vibration and they have a power and flexibility that a few years ago was thought to be beyond the possibilities.

All the Cars Are Lighter.

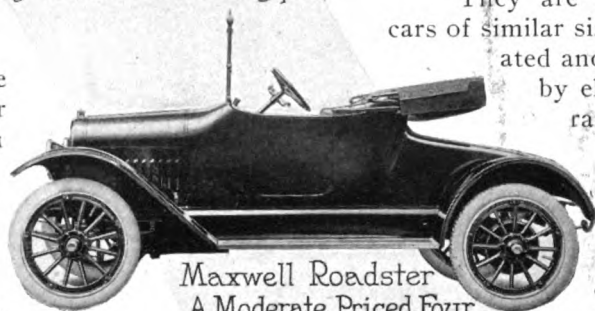
They are also much lighter in weight than former cars of similar size, and, therefore, are more cheaply operated and maintained. All are started and lighted by electricity. These systems, as well as the rapidly rising generator-battery ignition system, have become almost perfect in their performance.

Additional aids to simple and easy control are the magnetic gear shifts that have been introduced on some cars. Then for the man who demands the greatest ease, flexibility and simplicity in driving there is a revolutionary car, the Owen

magnetic, with an electric transmission, which is controlled like an electric storage battery car, but otherwise has all the attributes of the most luxurious gasoline automobile.

It is not only the eights and 12's that have been improved in power and lack of vibration. The sixes and

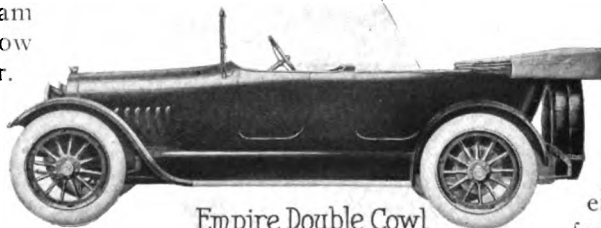
fours are much freer from vibration, much more powerful and efficient than formerly. Engines have small bores and run



Maxwell Roadster
A Moderate Priced Four



The Oldsmobile Eight
\$1195



Empire Double Cowl
Touring



Kissel Kar The Original
"All Year" Design

at higher speeds, up to 3400 revolutions per minute in one well known six—the Chalmers. Vibration dampers and counterbalanced crankshafts make some of these sixes and fours indistinguishable in that particular from the eights and 12's. More efficient carburetion has greatly increased power.

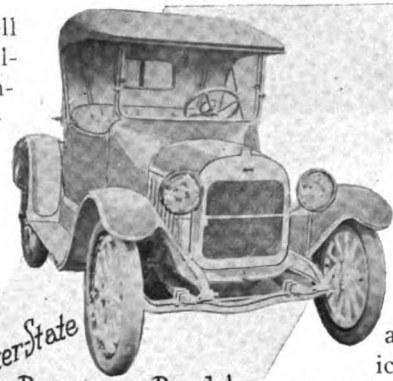
More aluminum in the design, smaller and more efficient motors, simplification everywhere, better and stronger materials tend toward improvement of all the cars, without regard to the design of the motor or the number of cylinders they employ.

A symptom of this tendency to simplification and lightness is the rapidly increasing use of cantilever springs. These springs have been found to yield riding qualities that equal any other type. They permit the use of a longer body on the same wheelbase in many cases, and they do away with many parts of the old springs.

The Knight motored cars are much liked for their silence, flexibility and because the motors improve with age and usage instead of deteriorating. They have no valves to be ground.

Below \$1000 there is one eight-cylinder model to be had, and a number of sixes. It is natural that these cars should not incorporate all the latest novelties in design since they are made in tremendous quantities and their characteristics cannot be changed so readily and their prices still be maintained. Nevertheless, the designs are strictly up-to-date in fundamentals.

In this class the outstanding feature is the reduction in price for cars that afford motor



InterState
Two Passenger Roadster

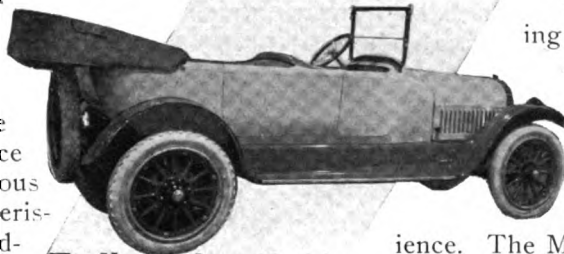
comfort
and serv-
iceability.

For \$395 there is the Saxon roadster, the price of which is the same as last year, but now is equipped with a three-speed transmission and several other improvements.



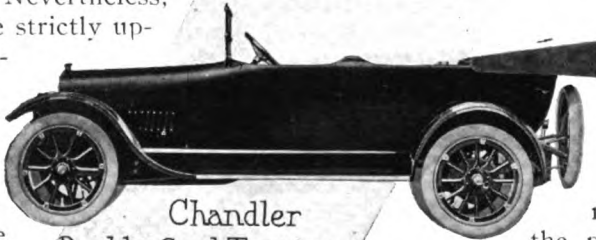
Chalmers Six Roadster

There is an Overland touring car for \$615 with electric starting and lighting system, three-speed transmission, electrical controls on the steering column, large tires, one-man top—every accustomed convenience. The Maxwell is its close competitor in the same field.



The New Jackson Eight

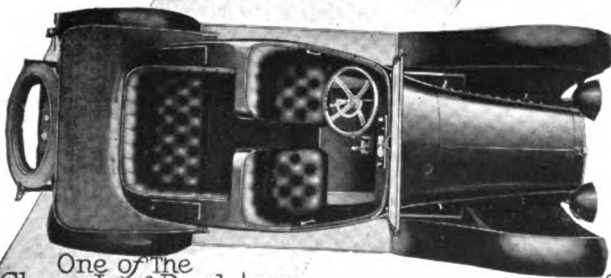
For \$695 the Overland company now offers a four-cylinder car that is similar in size of engine and other important characteristics to the car for which it received \$1075 last year. Here is a clear reduction of \$380 in price in a single year, and the motorist will fail to find any reason why



Chandler
Double Cowl Touring

the present car should not perform its functions as satisfactorily in every way as its predecessor. If there is any difference it is likely to be to the advantage of the new production.

And all this is true in greater or less degree of many other cars. It is true of the Studebaker model, which is made in a larger size; true of Chevrolet, Dort, Inter-State, Buick sixes and of scores of less well known cars. Some of these are entirely new, having been launched in 1915 by the buggy builders, who saw their business slipping away from them, or by business men from other fields who are attracted by the mon-



One of the
Clover Leaf Roadsters

umental profits motor car builders are said to have made.

Some of the new features of these cars are the increasing number of removable cylinder heads, the prevalence of single, generator-battery ignition and unit power plants, the substitution of high-grade process leather for low-grade real leather, standardization and reduction in weight of parts, simplifications of design, air brush painting and oven drying.

Nowhere does this reduction in price represent a backward step. It is not mere cheapness—it is high quality produced cheaply by new methods.

CUSTOM CARS AT SALON.

American and Foreign Chassis with Special Bodies Shown at Astor.

Foreign cars, a few fine American standard products, and a number of American chassis equipped with custom made bodies were shown at the Automobile Salon in the Hotel Astor, New York City. Although it is conducted under separate management, the Salon is really one of the features of the New York show.

The market for the type of car displayed there is extremely active just now, and that is a condition that has not existed for some time. Prosperity and big dividends have revived amazingly the demand for the \$5000 cars, and all of the leading makers in that class are said to be very far behind in their deliveries.

During the first day the Salon was opened a \$12,000 Rolls-Royce, the most expensive car in the display, was sold. And both the custom body builders and the American makers who displayed their regular cars did a good business. Sales for the first three days reached \$100,000.

The display was held in the grand ball room of the Astor, which has space to show 100 cars. The room itself is very richly furnished with tapestries and rugs and the architecture is magnificent. No attempt was made to add more decoration.

The cars displayed were the White, Simplex-Crane, Daniels Eight, Owen Magnetic, F. R. P., Singer, Brewster, Locomobile, Packard, Cadillac, and of the foreign makes the Peugeot, Rolls-Royce, Lancia, Delauney-Bellville, Austrian-Daimler and the English-Daimler. Coach work exhibits were made by Brewster, Bender-Robinson, Healey and Holbrook. Three accessory houses were represented: A. Faure, Hardman & Co., and the Westinghouse company.

Five Owen Magnetic cars, equipped with special bodies, designed by Miss Belle S. Andrews, sister of a vice president of the New York Central lines, were shown. These are enclosed cars and each is attended by a footman, whose uniform harmonizes with the color treatment of the car.

The Holbrook company showed custom made bodies on White, Cadillac and Packard chassis. There was a town car landaulet with detachable roof over the driver. It was upholstered in striped frizette with head lining in the same cloth, but of plain design. The belt panel was of cane work and the monogram is raised. The chassis is a Packard. Another chassis of the same make has a plain and handsome limousine body.

On a Cadillac chassis the company had a broken stream line body of novel design. It was a seven-passenger with a Victoria top upholstered in veltone and lined in broadcloth to match the upholstery. The rear cowl was fitted with a unique set of mahogany cabinets.

Another Cadillac had a seven-passenger Berlin body upholstered in striped velvet. The fittings were dull gold. The color was a beaver brown with upper panels in black and the chauffeur's compartment was upholstered in beaver brown leather.

The Daniels Eight was shown as a black brougham with enameled wire wheels. It was upholstered in imported tapestry with fittings in German silver. Handsomely designed reading lamps were provided.

There were in all 11 White cars in the exhibit, some with bodies made by the custom makers and some made in the White factory. The White standard bodies are designed and executed to resemble closely custom made bodies. The exhibit included a sedan, a limousine, a town car landaulet, a square brougham, a cabriolet, limousine, landaulet-limousine, roadster, town and touring car.

TWENTY MILLION FOR DIXIE WAY.

A claim that \$20,000,000 will have been spent in the improvement of the Dixie highway at the end of the next two years is made by the highway association. Of this \$1,765,200 has already been spent in 60 counties. These same counties are preparing to spend and are now raising \$6,931,000.

Reports indicate that hundreds of miles of the road will be paved with a permanent surface. Plans to this effect have already been announced for the sections from Chicago to Danville, Toledo to Cincinnati, Jacksonville to Miami and Tallahassee to Bartow.



ONE of the exhibits that proved the most interesting to the crowds that swarmed through the Grand Central Palace was the \$25,000 gold chassis, which was the centre of attraction of the Studebaker reservation.

More than 250 ounces of gold were used in the process of plating it and all of the 3000 parts of the chassis were finished in gold. The only firm in the country with facilities to do the plating work was Yale & Towne, Stamford, Conn., and it had to arrange for special vats and similar equipment.

The chassis was shipped from Detroit to New York City under heavy insurance and during the show it was guarded closely to prevent any of its parts being carried away. It is the most expensive chassis that has ever been shown. Several months were required to complete the job after it had come through the factory in regular production. Except for the gold the chassis is not different from others of the Studebaker line.

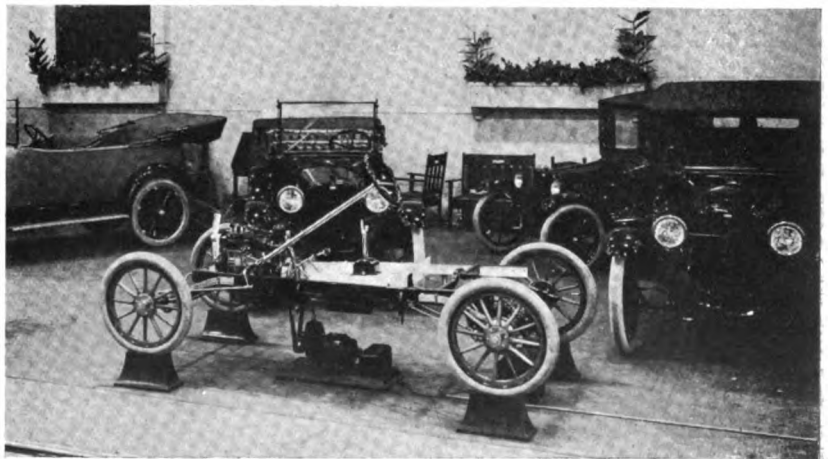
Its function in the show displays is that of drawing attention to the Studebaker exhibit, which, because of the standardized nature of the Studebaker cars, might otherwise have not attracted a large proportion of attention, except from actual prospective purchasers. After the shows the gold on the chassis will probably be reclaimed.

Another interesting display was that of the Packard Mo-

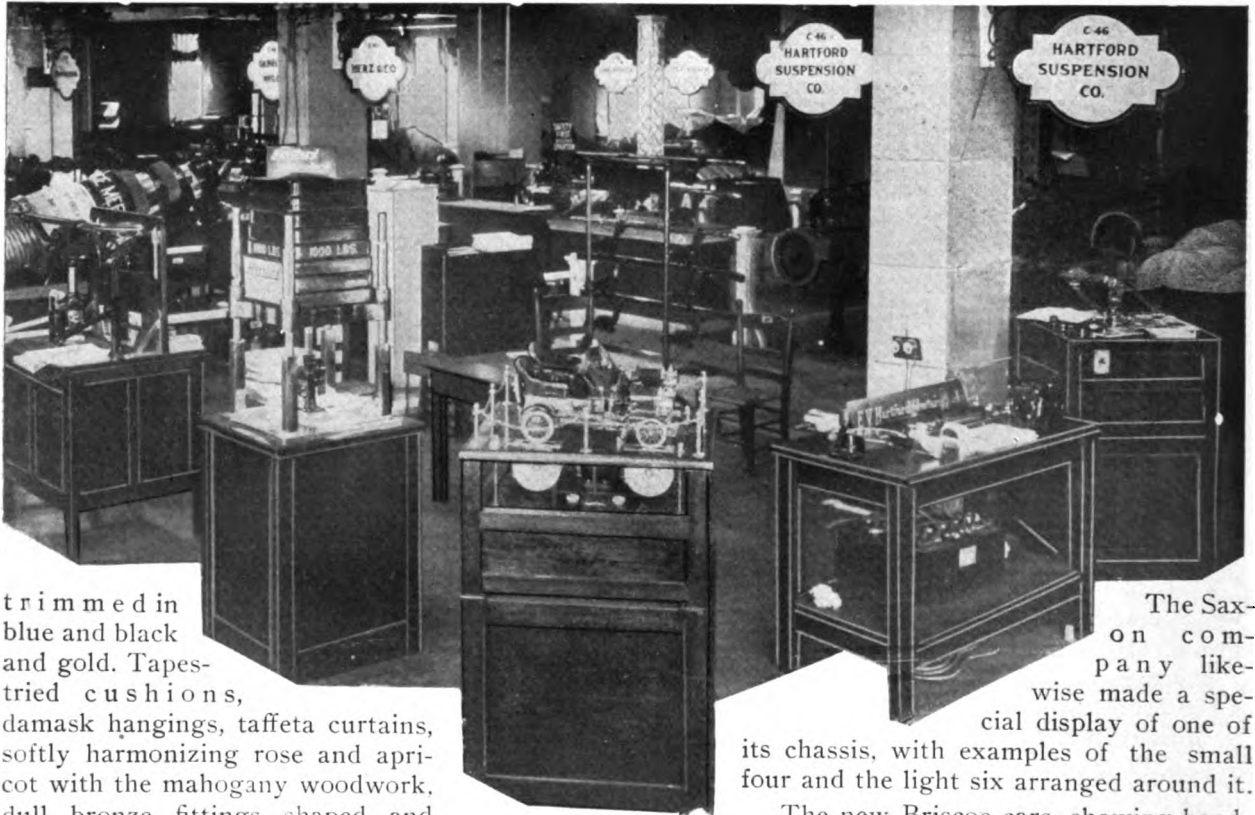
tor Car Company. It was made up of cars having special fittings and upholstery. From New York they will be shipped to Philadelphia and other cities. The various models have been given special names.

The Debutante, a six-passenger limousine, is trimmed in warm gray with panels of Veluvine white. The window frames are burl maple with ebony edging. The door panel escutcheons are handsomely painted and the upholstery is in gray and covered with English lansdowne linen envelops. Damask lace is used to edge the doors and the curtains are of ribbed white silk. Silver-mounted, hand-painted medallions ornament the walls of the rear compartment and embroidered foot cushions, toilet articles in dull silver mountings, gray leather card cases and other little vanities are provided.

L' Invitation, a seven-passenger limousine, is



Saxon Chassis Propelled by Electricity.



trimmed in blue and black and gold. Tapestried cushions, damask hangings, taffeta curtains, softly harmonizing rose and apricot with the mahogany woodwork, dull bronze fittings shaped and carved by hand, a black carpet and a telephone are other details of luxurious appointment.

The Chatelaine, a seven-passenger landaulet, is elegant in Japanese purple lake and a shade of green, combined with black. The upholstery is of reddish tan melton, and all the trimmings and appurtenances are special patina. The interior wood finish is dull rubbed mahogany.

The Duchess is a six-passenger limousine in velvety black and antique gold, with brushed gold trimmings, gold silk door cords and fine tapestried upholstery.

While the open cars were not so elaborately finished, they proved very attractive. A "1-25" runabout was finished in gray and black with just a touch of red. A stripped chassis showed the mechanical details of the machine.

Like Studebaker, the Hupp Corporation made a stripped chassis the centre of its display. Parts of the motor, transmission and axle casings were cut away to permit the public to examine the interior workings of the car. The chassis was shown on a railed-in dais, and was surrounded by examples of the standard Hupp production, which this year is more powerful, has a larger motor and is lighter than the Hupmobiles of last year.

A Corner on the Accessory Floor.

The Saxson company likewise made a special display of one of its chassis, with examples of the small four and the light six arranged around it.

The new Briscoe cars, showing handsome lines, made an attractive exhibit. One was finished in light colors, which accentuated the up-to-dateness of outline for which the product is noted.

Pierce-Arrow had its usual exhibit of handsomely finished closed and open cars, which were regarded with keen interest by visitors.

Kissel featured the "All-Year" car, the first to use the type of convertible top which has now come to be very popular and which hundreds of makers have this year imitated.

Jackson made a feature of its new eights, which have handsome stream line bodies. One of these was in gray, with top down, and attracted especial attention.

By no means was all the interest confined to the car exhibits. The accessory departments were handsomely decorated, spacious and educational. Such concerns as the Hartford Suspension Company, which showed all of the various devices which it makes to provide more comfortable motoring, received much attention from car owners.

Dealers and members of the trade were attracted to the garage equipment companies, like the C. A. Shaler Company of Waupun, Wis., which showed every variety of vulcanizing apparatus.

CHANGING EMPHASIS in DESIGN



WHILE there was more that is distinctly new at the New York show this year than there has been for many years, the greatest progress is to be observed in a general review of the cars to show which of those constructions that have been known and used by automobile engineers for a long time are gaining most in favor.

These changes are brought about largely by experience. They are made by men who are familiar with the performance of the devices in question in actual use. There is nothing experimental about such progress—something that is here for a trial today, but may be gone tomorrow.

Thus when it is noted that 78 per cent. of the cylinders are this year cast en bloc against 39 per cent. in 1914, it is reasonably certain that the block construction has been shown to have advantages in manufacturing or in performance not possessed by the single casting or the pairs.

Yet as conditions and processes are altered by progress the movement does not always continue in the same direction. It sometimes reverts to former practice. Constructions that were used in the first cars and found to be faulty have in some cases come back refined and with renewed popularity after they had once been practically abandoned.

This is true, for instance, of the wire wheel, which was used on the first cars, was then superseded by the wooden wheel, and is now rapidly coming back into favor. In the meantime the progress of the art has produced a much better wire wheel than was at first available. Wood wheels, because of shortage of the best material, are becoming more expensive.

Something similar has happened in at least two phases of ignition. The popular form at first was battery ignition from dry cells, or from the

storage battery. That design was abandoned for the magneto, supported, in most cases, by a second system of emergency battery ignition. In the meantime the electric starting and lighting systems have developed, supplying the car at all times with an automatically renewed source of electric current. The result is a rapid return to battery ignition.

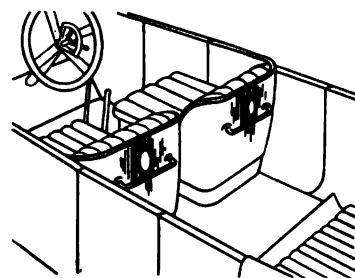
Single Ignition Now Dominant.

Single ignition, with the battery as the source, was the first form. Dual ignition, meaning a single set of plugs with two sources of current—the magneto and the storage battery—was dominant in 1910, when 25 per cent. of the cars had single ignition, 40 per cent. dual and 35 per cent. double. This latter form consisted of two sets of spark plugs drawing current from two magnetos or one double magneto.

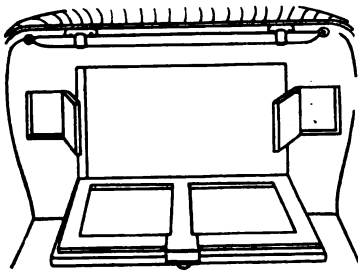
In 1916 we find that single ignition is used on 76 out of 100 models and dual ignition on 19. Double ignition has almost disappeared, less than two cars out of the hundred using it.

The location of the transmission has been changing. In 1910 75 makers out of 100 placed it amidships and 10 per cent. carried it in unit with the motor, while 15 carried it on the rear axle. To-day the unit power plant is ascendant. It is used on 64 cars out of every hundred, while on 21 it is retained in the amidship position. Fifteen still keep it on the rear axle.

For horsepower, according to the S. A. E. rating,



Tonneau Lights in the Westcott.



Storage Compartments in Back of Front Seat.

tors exceed their rating in actual power by a far greater margin than did the early motors, for the reason that they may be operated at a far higher speed.

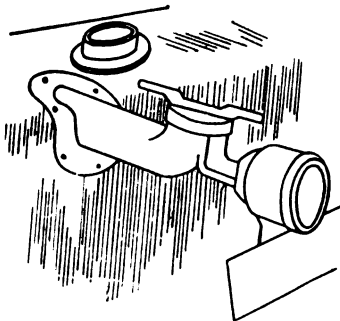
There has been a steady decrease in motor bore, from 4.85 inches to 3.57. Stroke during the same period ranged from 4.70 in 1910 to 5.30 in 1914, and then went down again to 4.98. The piston displacement followed the bore from 280 inches to 349 inches and then declined to 280 inches.

The average price for 1916 is \$1600, which is \$400 less than last year and \$1035 less than the lowest point reached in 1914.

In connection with all these averages, however, it should be remembered that they are based on models made and offered for sale and not on cars actually sold. If it were possible to base them on cars actually used the result would be far different, since the characteristics of the Ford model T, for instance, would count for nearly 40 per cent. in the calculation, instead of for far less than one per cent., as is the case when the averages are figured on a basis of models.

How Cylinders Divide.

Four-cylinder designs have declined steadily for the last six years, from 82 out of every 100 cars to 39. Six-cylinder types have increased from 10 per cent. to 46 per cent., while the new V constitutes 15 per cent. of the cars, 12.5 per cent. being eight-cylinder and 2.5 per cent. being 12's.



Westcott Combination Tail Light and License Number.

increased from 1910 until 1913, the increase during that time amounting to 2 1/10 horsepower. It has now fallen to 28.66. It is probable, however, that the present mo-

tors exceed their rating in actual power by a far greater margin than did the early motors, for the reason that they may be operated at a far higher speed.

The L head cylinder gains consistently in popularity. It now represents more than 73 per cent. of the production, while the I head, or overhead valve, has 13.7 per cent., a decrease of about six per cent. in six years. The T

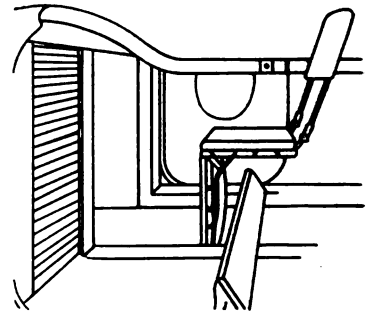
head also has 13 per cent., a loss of five per cent. in the same length of time.

Thermo-syphon cooling is used in 39 out of every 100 models and pump circulation is employed in a trifle more than 61 out of every 100 cars.

Electric starters, which first appeared at the show in 1912, are now equipment on 99 out of every 100 cars. Vacuum feed is by far the most popular method of delivering gasoline to the carburetor, 53.8 per cent. of the cars using it, while more than 31 per cent. still use gravity feed. Pressure feed and combinations of gravity and pressure are used on 14.5 per cent. of the cars.

The disc clutch is used on 53.4 per cent. of the cars and the cone on 45.5 per cent. The selective gearset has 96.5 per cent. representation, as against 85 per cent. six years ago. In 1910 right drive steering was used on 93 out of 100 cars and this year on 6.5 cars, while left steering, which was then used on two cars, is now on 87.1.

Wood wheels still remain on 82 per cent. of the cars, but wire wheels are either optional or standard on 17.5 per cent. In three years the spiral bevel in the final drive has advanced from nothing to 56.8 per cent. Full floating rear axles are used on more than half the cars, and half and three-quarter floating are about equally divided among the remaining models.



Disappearing Auxiliary Seats in Mercor.

Helical or spiral timing gears are used on 73 cars; there is a silent chain on 18 out of 100; and the spur gear, once almost universal, has declined to 8.5 per cent.

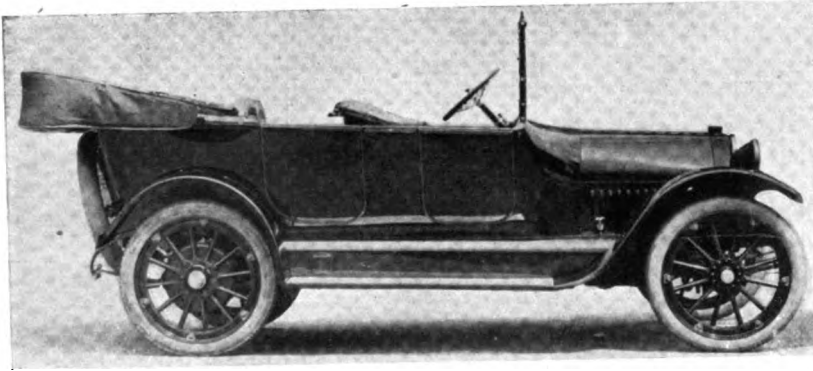
REO MADE BILLY GROVE RICH.

In 1904, when the Reo Motor Car Company was founded, Billy Grove, a clerk in the Downey house, in Lansing, Mich., bought \$1000 worth of the stock. Recently when the stockholders decided to increase the capitalization of the concern to \$10,000,000, he figured up what his \$1000 had brought him and it figured out at \$118,000. This includes dividends, stock dividends and the stock he now owns, which amounts to 2400 shares. He is now manager of the hotel.

NEWS ANNOUNCED AT THE SHOW.

Cars and Models Introduced to the Public at Grand Central Palace for the First Time—Visitors Display Much Interest.

TAKING advantage of the great interest aroused by the New York show, a number of manufacturers during the week either announced or over \$3,000,000 on aluminum alone. The car has a new motor that employs the block cylinder casting instead of the individual cylinders, which formerly was Overland practise. While this is by far the most popular type of cylinder casting with American manufacturers, it is a better manufacturing proposition. It represents one of those points where an improvement in quality is accompanied by a lowering of manufacturing cost. The casting has a removable cylinder head, which is another feature that is rapidly winning



The Studebaker Is \$40 Cheaper.

nounced material changes in price or the production of new models on which they will build their business during the coming year.

These announcements included a \$55 price reduction in the Overland \$750 touring car; the Studebaker Corporation took \$40 off the price of its four and six-cylinder touring cars, and \$25 off its four-cylinder roadster; the Haynes company announced two new 12-cylinder cars; Briscoe announced a four-cylinder touring car at \$585; the Hudson company made an advance of \$25 in the price of its Super-Six; Peerless disclosed a new eight-cylinder model.

During the past six months, following its debut early in the summer, sales of the Overland model 83, at \$750, had broken all Overland records. Fifty thousand buyers had purchased cars. The reduction in price of \$55 on this model is therefore of very wide interest.

Advance Buying an Aid.

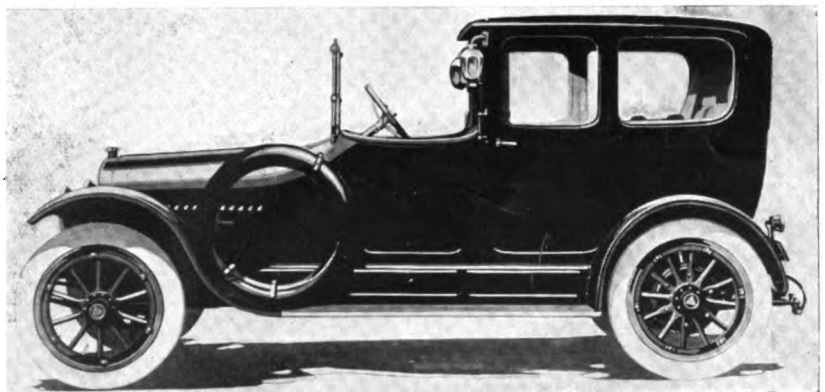
The greatly enlarged Overland factory, with corresponding increase in volume of business, and the fact that materials had been purchased a long time ahead, are said to have made the new price possible. Because of

favor among motor car owners generally.

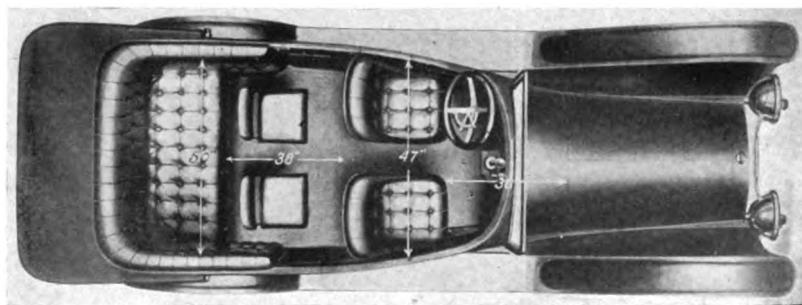
The bore of the motor remains at $4\frac{1}{8}$ inches, while the stroke is $4\frac{1}{2}$ inches. It is powerful and has proved smooth, quiet and economical. The wheelbase is 106 inches. Quick detachable tires, 33 by four all around, are used with non-skid tread in the rear. Cloth upholstery is replaced by motor quality Fabrikoid.

The car is offered as a two-passenger roadster for \$675.

With the backing of Chicago capitalists, who are said to belong to the Swift group, the Briscoe company has acquired several parts making plants, and the savings made possible by this en-



The New Hudson Super-Six.



Plan View of Haynes 12.

largement of operations has led to the announcement of a new four-cylinder car to sell for \$585. The motor has block cast cylinders, $3\frac{1}{8}$ by $5\frac{1}{8}$ inches, and thermo-syphon cooling. Lubrication is accomplished by the constant level splash system. A feature of the floating rear axle is the use of a gearless differential.

An Improved Differential.

This type of differential applies the power to the wheel that runs slowest instead of the one that goes fastest, and so eliminates the possibility of stalling when one wheel is on solid ground and the other in a soft spot.

The equipment includes two-unit starting and lighting, one-man waterproof top, rain vision, clear vision windshield, and electric horn and tools. Tires are 30 by $3\frac{1}{2}$ inches, with demountable rims. The car is made in five-passenger and two-passenger models.

There are few changes in the new Studebakers brought out at a reduced price. One of the chief differences in the new series is the adoption of Stewart vacuum gasoline feed and the removal of the gasoline tank from the cowl to the rear of the body. The front seat is divided into two individual chairs, and provision is made for moving them forward or back $1\frac{1}{2}$ inches, according to the desires of the passengers.

The pedals have been lengthened to provide a greater leverage. The depth of the rear seating space has been increased two inches, making a roomier tonneau. The windshield glasses overlap a fraction of an inch. The removal of the gas tank from the cowl has enabled that part to be redesigned so that the instruments have been neatly arranged on the board.

Two New Haynes 12's.

The Haynes company has developed a 12-cylinder motor

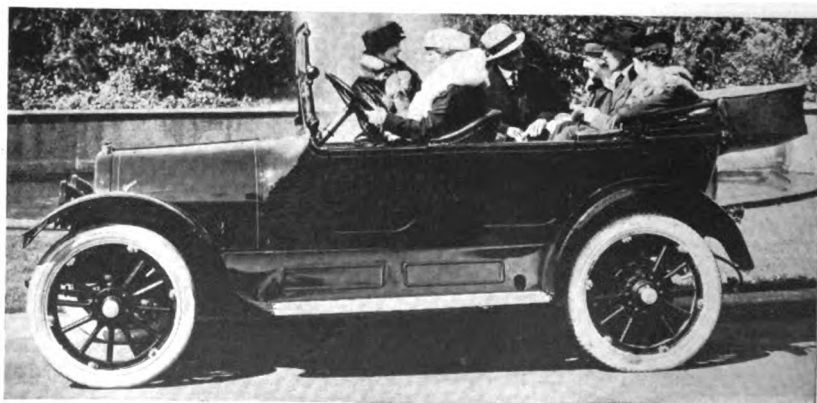
which can be installed instead of the usual six-cylinder in both the 34 and 35 Haynes models. The additional cost will be about \$400, and the cars in all other respects will be substantially identical. The dimensions of the new motor are $2\frac{3}{4}$ -inch bore by five-inch stroke—an exceptionally long stroke design. The motor is attached to the frame at three points. The cars are very com-

pletely equipped and wire wheels and cord tires are standard.

The Hudson Super-Six, while retaining the same sized motor and the same general design as previously, is said to develop 80 per cent. more power than formerly. In a stock car test supervised by the American Automobile Association on the Sheepshead Bay track this car broke all stock car records for speed and power.

Exact details by which this very remarkable improvement was accomplished are not made public. It is said to be largely the result of the elimination of vibration from the motor and the consequent reduction in the amount of absorbed horsepower and the increase in the amount of power delivered to the wheels.

The vibration damper, or whatever is used, has been patented. This engine is made entirely by the Hudson company, which has usually purchased its motors ready made, and great attention has been put upon refining it. The manifolds have been redesigned and improved and a marked betterment in carburetion is also said to have been effected. The company is making its own carburetor, which is described as pneumatically controlled. The motor is of a higher speed design than formerly, it running up to 2600 or 3000 revolutions.



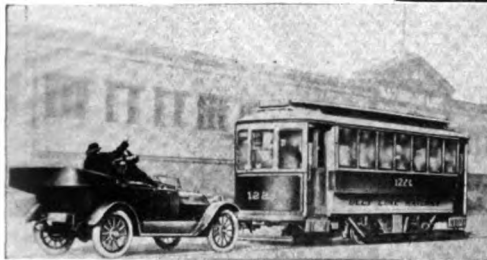
Large Overland Four \$55 Cheaper.

DEMONSTRATION OF HARTFORD BRAKE.

THE power of a Hartford electric brake was graphically illustrated at the Safety First Forum, held under the auspices of the Safety First Society at the Hotel Biltmore, New York City, in a reel of moving pictures. The film shows a Studebaker car, moving at the rate of about 25 miles an hour, and a trolley car, moving at about 10 miles, about to meet in head-on collision. Both cars are equipped with Hartford electric brakes, and though the automobile weighs 3000 pounds and the trolley car about 16,000, both were checked instantly. Other pictures on the reel showed various brake trials in all sorts of traffic conditions in New York City.

An interesting feature of the test was that the street railway company demanded a surety company bond, in case the trolley car became damaged, and also asked to have the life of the motorman insured against accident.

The Hartford brake,



made by the Hartford Suspension Company, attracted wide attention at the New York show, where it was demonstrated within the building and also outside.

ROAD TAX FOR MAINE.

Motorists and other good roads boosters in Maine recently met for a discussion of ways and means of continuing road improvement in the state. Of the \$2,000,000 bond issue made some years ago, all but \$200,000 has been expended. It was the sense of the meeting that a one mill road tax should be assessed to carry on the work. This would supply about the same amount of money that has been spent in recent years.

Among the speakers at the meeting were Paul D. Sargent, engineer of the state highway commission; Dr. Joseph H. Pratt of the North Caro-

lina state highway commission, A. G. Batchelder of the American Automobile Association, Prof. George T. Files of Bowdoin, Secretary of State John E. Bunker, Benjamin F. Cleaves.

233,325 OWNERS IN NEW YORK.

Figures issued by the secretary of state of New York show that 233,325 motor cars were owned in that state on the first of the year, and that automobile owners had paid \$1,905,153 into the treasury for registration during 11 months, as compared with \$1,618,060 for the entire 12



The Hartford Electric Brake Installed (Oval), How It Is Operated from Driver's Seat (Top), and View of Test Being Made on West Street, New York City.

months of 1914. With another month still to come before the fiscal year ends, the

sum is sure to be considerably more.

There are three registration districts in the state. The following table shows how the cars are divided:

	Owners	Dealers	Chauffeurs	Receipts
New York...	101,074	724	55,222	\$921,817.00
Buffalo	72,815	750	13,086	548,565.50
Albany	57,237	725	12,958	434,770.50
Total	231,126	2,199	81,266	\$1,905,153.00

Towards the total amount, owners, chauffeurs and dealers have paid in registration fees the following:

	Owners	Chauffeurs	Dealers
New York.....	\$738,112.50	\$149,084	\$15,448
Buffalo	484,267.50	41,433	16,371
Albany	374,332.50	40,235	14,792

RECORD SHOW AT CHICAGO.

**Management Predicts an Exhibition Nearly as Large as That Held at New York—
News of Other Shows Either in Progress or Preparation.**

JAPANESE influence will predominate in the scheme of decorations at the Chicago automobile show, to be held Jan. 22-29 in the Coliseum and First Regiment Armory. Last year the theme was that of an old English garden, but this year it will consist of decorations that will suggest a Japanese garden. This will be accomplished by the use of Japanese kiosks and lanterns.

This exhibition, like that held at New York City, is in charge of the National Automobile Chamber of Commerce, and all indications presage a

uled for display approximately 176 manufacturers and distributors, 41 of which did not show their wares at the New York show.

PHILADELPHIA SHOW MAKES RECORD.

The 15th annual automobile show of Philadelphia, held under the auspices of the Philadelphia Automobile Trade Association, was opened on the evening of Jan. 8 at Convention hall with the record breaking attendance of about 10,000 persons. In the number of exhibitors and models



Home of the Chicago Automobile Show, the Coliseum, Which Will Be Opened Jan. 22 to Thousands of Visitors.

show that in physical proportions and in point of interest will not fall far below that just closed at Grand Central Palace. Like in former years, the Chicago show will furnish opportunity for dealers and manufacturers of the middle west and the southwest to fraternize and to place and receive orders.

Two weeks before the opening of the show it was announced authoritatively that 86 manufacturers of gasoline pleasure cars would be represented by displays of models, and that in addition to these there would be seven electric vehicle makers. In the accessory field there was sched-

displayed this year's show surpasses all others, there being 61 exhibitors, showing 68 cars. Three of these are electrics and one is a steamer, the balance being gasoline vehicles. Adding the number of exhibitors of accessories to the car displays brings the grand total to well over 100.

The management, which consists of Wm. P. Herbert, president; J. C. Bartlett, vice president; Louis C. Block, A. N. Makthy and Secretary G. E. Gomery, gave particular thought to the musical programme and laid out a series of vocal and instrumental solos and quartettes.

Convention hall was crowded to its utmost

to provide room for the exhibitors and the visitors.

BALTIMORE'S PLANS COMPLETE.

The Baltimore automobile show, to be held at the Fifth Regiment Armory, Jan. 18-22, will have about 25 per cent. more exhibitors than at any previous exhibition in that city. Large sums of money have been expended on the decorations, the theme of which will be Venetian. Wrought iron Venetian lamps will hang from the ceiling and the walls will be covered by a huge mural painting representing the celebrated sea wall that keeps the Adriatic from engulfing the city of Venice.

At the time the space allotments were made there were about 60 exhibitors scheduled, and, incidentally, there were several clamoring for space after the lists had been closed.

NEW BEDFORD PLANS BIGGER SHOW.

On the opening day of New Bedford's second annual show, Jan. 10 (it is to continue to Jan. 15), the promoters were confident that the exhibition was the most successful ever held in that Massachusetts city. The state armory is tastefully decorated and practically all the new cars that have been announced for 1916 are on display. Stephen D. Peirce is manager of the exhibition, which is given under the auspices of Fourth Company, C. A. C., and 6th division, Naval Militia.

INTERSTATE REGISTRATION COMING.

Congressman W. C. Adamson of Georgia, chairman of the committee on interstate commerce, has offered a bill to the House of Representatives which provides that any motorist who has conformed to the laws of his own state, paid his automobile taxes and registered his car, may use the car in any state in the United States without paying additional taxes or again registering it.

The exemption covers only taxes and registration and the owner must conform to all the traffic and other regulations of the state in which he is using his car. It is likely that if sufficient demand for the legislation is made it will be passed. The American Automobile Association and related clubs are supporting the proposal.

HYATT'S MANY INVENTIONS.

John Wesley Hyatt, on the occasion of his 78th birthday recently, told how he came to invent the Hyatt bearing and told of some of his other patents, which total nearly 500 in all.

In 1880 he was working on a sugar cane mill and had perfected a mill superior to any in use at the time, but could find no bearing in the market which worked satisfactorily. So he made some experiments himself, at first with wood rollers, then solid steel rollers with vulcanized pipe and with tubing, in which he used many types of cages and retaining bars.

After several years the Hyatt flexible roller was developed and a company was organized for its manufacture. It was made first in a small building in Newark, but increasing demand for the bearing has brought about constant enlargement of the factory. It is now a very large organization, with branches in all parts of the United States.

Many of his patents have to do with chemical processes. He some time ago was awarded the Perkins medal and his name enrolled with six great

American chemists who have received that honor.

Mr. Hyatt began life as a journeyman printer. His first invention was a family knife sharpener, which included the devising of a new method for making solid emery wheels. He experimented to find a new substance to replace ivory in billiard balls.

Mr. Hyatt established also the Celluloid Company of Newark and took out patents covering the fundamental invention of celluloid. With his brother, Isaiah S., he devised more than 75 patented articles during the next few years. He took up the filtration of water, perfected a process and founded the Hyatt Pure Water Company.



John Wesley Hyatt, Inventor of Hyatt Bearings.

MASSACHUSETTS' NEW HEADLIGHT LAW.

Highway Commission with Approval of Governors' Council, Adopted New Lighting Regulation, which Is Now in Force.

AS a result of a long investigation of the headlight situation and the use of dimmers, the Massachusetts Highway Commission drew up a regulation which went into effect as a law Jan. 1.

It affects not only cars that are registered under the Massachusetts statutes but those from other states that may be operated in the state.

The text of the regulation follows:

Wherever there is not sufficient light within the limits of the highway location to make all vehicles, persons or substantial objects visible within said limits for a distance of at least 150 feet, the white lights which a motor vehicle is required to display by Section 7, Chapter 534 of the Acts of 1909, when said vehicle is in motion, must throw sufficient light ahead to show any person, vehicle, or object upon the roadway straight ahead of the motor vehicle for a distance of at least 150 feet.

Any light thrown directly ahead or sidewise shall be so arranged that no dazzling rays from it or from any reflector shall be at any time more than three and a half feet above ground on a level road at a distance 50 feet or more ahead of said vehicle, and said light shall be sufficient to enable the operator of the motor vehicle to see any person, vehicle, or substantial object upon the roadway or side thereof for 10 feet on each side of the motor vehicle 10 feet ahead of said vehicle.

No Recommendations Made.

While promulgating this regulation the highway commission at the same time refrained from recommending any device or devices that would accomplish the result successfully, and has definitely announced that it will not recommend or approve any such devices.

The regulation was adopted, however, after tests had been made of a large number of devices and was doubtless framed only after these tests had shown that there were many devices available that would accomplish the result required.

Mere dimming of headlights or turning them off when meeting another car is not sufficient under the law, for in that case the lights would not throw sufficient light ahead for a distance of 150 feet. It would, of course, be possible to travel on well lighted thoroughfares with headlights dimmed or turned off, but on a dark street or road that would not do.

One of the most important points is that the

headlight shall show no glare at a height greater than $3\frac{1}{2}$ feet above the road at 50 feet from the car. The provision that the light must show people 10 feet to the side of the car and 10 feet ahead, means that the rays of light must leave the headlight at an angle of 45 degrees sidewise. This is the result of reports of people injured by stepping into the roadway because the driver could not see them at the side of the car. The use of small sidelights does not give sufficient light, the commission has found, to avoid this kind of accident.

There are many ways of meeting the requirements. On a few cars the headlights are set so low on the car that they automatically conform to the law. It is probable that a great many cars can be made to meet the requirements by proper focusing of the light in the parabolic reflector and by bending the light standards slightly so that the light will be thrown downward upon the road. This requires careful work of a nature to which the ordinary garage and repairman is not yet accustomed, and some experience will be necessary in many cases before it can be done.

Paint May Be Used.

It is also possible to secure the right results by painting a part of the electric bulb and reflector with a translucent paint. Many lenses and prisms, mostly of ground glass, have been developed and yield the results required with more or less success. A number of metal shields to cover a part of the electric bulb are also on the market.

Most of these devices, however, reduce the available light to about one half of its normal power. Since the law calls for white lights the use of colored glass lenses is not permissible.

No recommendations are made by the commission and the motorist can take his choice of the various devices offered. No maker can truthfully claim that his device has been approved by the commission except in so far as immunity from arrest by the users of the device constitutes approval. Enforcement of the new law may not be extremely strict during the first few weeks, but as the 1916 season progresses it will be rigorously enforced.

GENERAL NEWS OF THE INDUSTRY.

Tremendous Increases of Capitalization Indicate Flourishing Condition of the Industry—General Motors Declares Dividend—Peerless Sales Reached \$11,458, 513 in 11 Months—Personal News.

PHENOMENAL advances in the market prices of automobile stocks during 1915 make that year the greatest in the history of the industry. The period was made memorable by huge profits despite the sharp reduction in selling prices of vehicles, and by the large increase in distributions of profits to stockholders.

A rich harvest has fallen to the lot of investors during 1915, they having received initial and increased dividends on a scale unheard of in Wall street in this class of stocks.

Indicative of the advance of the industry itself is the fact that in the past 10 companies increased their total capitalization by \$169,225,000. The greatest increase was made by the Ford company, it having increased its capital to 50 times its original amount. Chandler came next with an increase of about 23 times. The three big leaders at present, in the point of size of capitalization, are Ford, with proposed capital of \$100,000,000; Overland, with \$50,000,000, and Chevrolet, with \$20,000,000, which may be increased to \$80,000,000 if the plans of W. C. Durant and others do not miscarry.

The following table shows the increases of the 10 companies:

Ford Company.....	\$2,000,000 to	\$100,000,000
Willys-Overland Company....	25,000,000 to	50,000,000
Chevrolet Company.....	2,500,000 to	20,000,000
Hupp Motor Company.....	1,000,000 to	6,500,000
Saxon Company.....	350,000 to	6,000,000
Chandler Company.....	425,000 to	10,000,000
Franklin Company.....	900,000 to	2,000,000
Continental Company.....	500,000 to	2,900,000
Perfection Spring Company..	1,500,000 to	2,500,000
Simplex Company.....	1,500,000 to	5,000,000

Record breaking advances have been made by the four automobile stocks listed on the New York exchange during the year 1915, the extreme range of their prices being as follows:

	High	Low	Advance
General Motors, com.....	558	82	476
General Motors, pfd.....	136	90%	45%
Willys-Overland, com.....	268	87	181
Willys-Overland, pfd.....	115	95½	19%
Studebaker, com.....	195	35¾	159¼
Studebaker, pfd.....	119½	91	28½
Maxwell, com.....	92	15¼	76¾
Maxwell, 1st pfd.....	103	43¼	59¾
Maxwell, 2nd pfd.....	68½	18	50½

Profits for the companies included in General Motors have been running, according to an official statement, at the rate of \$24,000,000 per annum, which is equivalent to about \$150 per share of the common stock.

The Willys-Overland Company is expected to show profits for 1915 of about \$12,000,000, which is equivalent

to approximately \$55 per share on \$21,000,000 common stock outstanding. The company turned out about 100,000 cars during the 12 months and is expected to produce 200,000 in 1916.

Studebaker Corporation made profits during the same period of about \$10,000,000, on both its war order and domestic business, which shows over \$30 per share of common stock. Last year the rate was just under \$15 per share. It is reported that Studebaker war business amounted to more than \$20,000,000 profits on which reached more than \$4,000,000.

The Maxwell company has been earning better than 15 per cent. on the common after allowing for preferred dividends, and at the end of the fiscal year, July, 1916, is expected to show an output of 60,000 cars, which represents an increase of approximately 100 per cent. as compared with 1914.

STOCKHOLDERS ARE DISAPPOINTED.

It is said that the stockholders of the General Motors Company are disappointed over the fact that the declaration of dividends made Jan. 6 did not come up to what they had expected. They thought they might get a stock dividend of 100 per cent. and a cash payment at the rate of \$5 a quarter on the new stock, which would be at the rate of \$10 a quarter on the present stock.

Instead, no stock dividend was declared, and the dividends inaugurated were at the rate of only \$5 a quarter, with a bonus of \$5 as representing payment for the last three months of the year. Following the announcement the market price of General Motors fell off 45 points, which drop is generally attributed to the declaration.

The statement accompanying the declaration was, "The directors expect hereafter to declare quarterly dividends on a conservative basis and to consider at the end of each fiscal year such additional dividends, if any, the earnings of the fiscal year and the financial condition and prospects of the company warrant."

PEERLESS TRUCK AND MOTOR COMPANY.

President Gilbert of the Peerless Truck and Motor Corporation has issued a statement which gives aggregate sales billed for 11 months ending Nov. 30, 1915, as \$11,458,513. Net profits of constituent companies after deduction of liberal charges for maintenance and depreciation, before deducting interest, aggregate \$1,930,058. This is at the rate of \$9 a share per year, or 18 per cent. of par value, on the entire outstanding capital stock of \$10,000,000, after providing for interest on the six per cent. convertible gold notes.

Cash balance of the Peerless Truck and Motor Cor-

poration and subsidiary companies as of Nov. 30, 1915, aggregated \$2,389,400, which is equal to \$12 a share, in addition to which they have investment securities that can be marketed at any time at a value of about \$500,000.

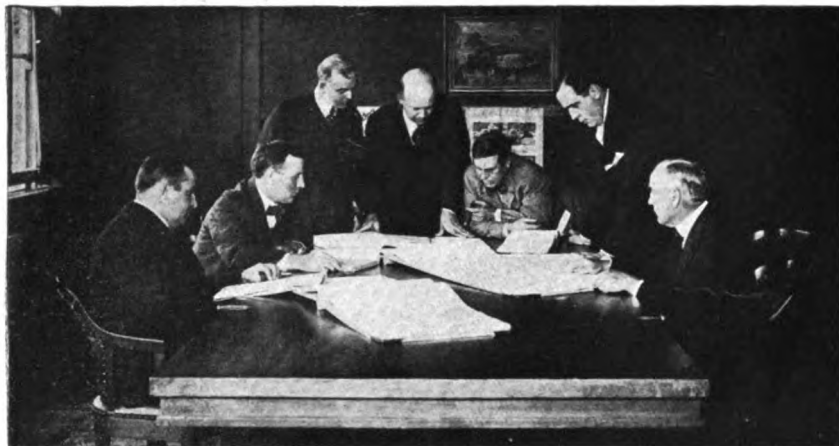
FRANKLIN CAPITAL INCREASED.

Stockholders of the Franklin Automobile Company, Syracuse, N. Y., have voted to issue \$1,100,000 additional common stock, which will bring outstanding capital up to \$2,600,000. The last of the preferred stock was retired last July. The company has no bonds, so that the business is entirely owned by the common shareholders.

BIG BUSINESS FOR MITCHELL.

The Mitchell-Lewis Motor Company, Racine, Wis., reports through J. W. Bates, its chief engineer, that the company is still working 24 hours a day and during the first five months of its fiscal year has moved more cars than in any fiscal year up to this time.

Mr. Bates declares that the automobile business in



Directors of the Mitchell-Lewis Motor Company, from Left to Right: Guy W. Morgan, Purchasing Agent; W. H. Armstrong, Secretary; M. J. Gillen, Comptroller; H. L. McClaren, President and General Manager; J. W. Bates, Chief Engineer and First Vice President; O. C. Friend, General Sales Manager; F. L. Mitchell, Treasurer.

general is phenomenal, and that manufacturers are not going to be able to keep up with their specifications when the spring business opens. Mitchell business at this time is exceeding the average opening spring selling months even at this time. One source of pleasure to the officials of the company is that ample provision has been made against the possibility of shortage in materials in the Mitchell organization.

REO DECLARES DIVIDEND.

The Reo Motor Car Company recently declared a 100 per cent. stock dividend, increasing stock outstanding from \$3,000,000 to \$6,000,000. Stock authorized is \$10,000,000, leaving \$4,000,000 in the treasury. In 1915 cash dividends paid amounted to 37½ per cent., while net earnings for the fiscal year ending Oct. 31 are estimated at approximately \$3,500,000, or 116 per cent. on \$3,000,000 stock, and 88 per cent. on the enlarged capitalization.

NEW \$4,000,000 AUTO CONCERN.

A new corporation with \$4,000,000 capital will be organized to take over the business of the Grant Motor Company, Findlay, O. It is understood that the two banking firms of Andrews & Co. and Livingston & Co. will take \$1,000,000 in preferred stock and \$2,000,000 in common stock, \$1,000,000 in common to be reserved to exchange for the preferred.

The purchasers are reported as now forming a syndicate to underwrite \$1,000,000 of preferred and \$600,000 of common stock and will place it on the market.

NEW WHITE MOTOR DIRECTORS.

At a meeting of the White Motor Company at Cleveland the following were elected directors: Theodore Roosevelt, Jr., Warren Bicknell, E. W. Moore, Otto Miller and J. R. Nutt, all of Cleveland; Horace Harding, E. R. Tinker, vice president of the Chase National Bank; A. M. Hall, vice president of the Liberty National Bank of New York.

It is understood in financial circles that at a later date the appointment of Windsor T. White as a director and as president of the company will be announced. Walter C. White and B. Johnson of Cleveland are likely to be made directors at the same time.

The White Motor Company, which was incorporated under the laws of Ohio, has taken over all the assets of the White Company of Cleveland. The capitalization of the new company is \$16,000,000 common stock, par value of the new shares being \$50. The net earnings of the White Company for 1915 were about \$8,000,000, or an amount about equal to 50 per cent. on the capital of the company.

There will be no bonds or preferred stock in the new company and preferred stock of the old company will be retired immediately.

Developments are being eagerly watched.

FORMS H. A. LOZIER COMPANY.

Formal organization of the H. A. Lozier Company has been reported from Cleveland, O. The following have been elected to office: H. A. Lozier president; E. W. Foote, vice president; E. G. Tillotson, treasurer; Frank H. Ginn, secretary. Mr. Tillotson is at the head of the bond house of Tillotson & Wolcott Company. Mr. Ginn is a prominent Cleveland attorney. The stock is understood to have been taken up by a limited number of investors.

DIVIDE PACKARD PROFITS.

Alvan Macauley, vice president and general manager of the Packard Motor Car Company, announced Jan. 1 that the directors of the company had declared a 10 per

cent. stock dividend and a 1½ per cent. cash dividend on the common stock.

This stock dividend is the second that the company has distributed among owners of the common stock, having paid a 40 per cent. stock dividend on Oct. 16, 1913, representing an issue of new stock to the par value of about \$2,000,000.

It was also reported in financial circles that Wm. A. Read & Co. of New York City purchased from the Packard company \$3,000,000 of its cumulative seven per cent. preferred stock. Proceeds of this sale will be used by the company in carrying on its increased business during the next year and will place it in position to pay off \$3,000,000 five-year five per cent. notes maturing Dec. 1, 1916. The bankers have already sold a large portion of the stock.

NEW OVERLAND SALES PLAN.

The Willys-Overland Company has divided the country into 13 sales zones and has appointed managers for each to handle the sales of the company direct. Headquarters and managers of the respective zones are as follows: Boston, W. B. Sawyer; Philadelphia, A. W. Barber; New York City, E. M. Lied; Atlanta, E. N. Culver; Toledo, K. R. Jacoby; Kansas City, E. G. Hosler; St. Louis, J. E. Toole; Chicago, C. E. Wagner; St. Paul-Minneapolis, F. N. Coats; Omaha, C. H. Tyler; Dallas, W. D. Sapp; Denver, George A. Clark; Pacific Coast, B. J. MacMullen.

All zone headquarters will have stocks of cars and parts for quick delivery and distribution to Overland owners and dealers.

The company will continue to operate the factory branches already established and will locate others. G. M. Berry, former advertising manager, has been appointed to the new position of director of branches. Atlanta, Cleveland and Kansas City either already have or will have factory branches, and in addition to these there will be or already are service stations at New York City, Boston and St. Paul.

STANFORD JOINS WESTCOTT.

E. E. Stanford, for several years connected with the purchasing department of the National Motor Vehicle Company, Indianapolis, has joined the Westcott Motor Car Company, Richmond, Ind., as purchasing manager. This appointment is in line with the recent additions to the personnel of the Westcott factory organization, which has been made necessary by the steadily increasing business of the company.

FOUNDER OF MITCHELL-LEWIS DEAD.

William Turner Lewis, second vice president of the Mitchell-Lewis Motor Company, Racine, Wis., and the last of the four founders of the business, died of apoplexy at his home Dec. 30. Mr. Lewis was 75 years old; he was born at Utica, N. Y., and moved to Racine when 15 years of age. He took part in the Civil War as telegrapher. He married a daughter of Henry Mitchell, a northwestern wagon manufacturer of much prominence. Later the business became the Mitchell-Lewis Motor Company, at the head of which was the

late deceased's son, Capt. William Mitchell Lewis. Mr. Lewis enjoyed much political preferment, once being nominated for the United States Senate.

MARTIN FIFTH WHEEL INCORPORATED.

The Martin Rocking Fifth Wheel Company, Springfield, Mass., has taken over the business and the patent rights of C. H. Martin, and the officers of the new corporation are announced as follows: C. H. Martin, president; Adolf A. Geisel, treasurer; H. G. Farr, secretary.

The officials declare that the demand for the tractor-semi-trailer made by the company necessitated bringing in additional capital to provide facilities for increased production.

DURANT MEETS WITH OPPOSITION.

Eight of the 14 directors of the General Motors Company have sent a letter to the stockholders of the company, announcing that they are not a party to any arrangement looking to the vesting of control of the General Motors Company in any other company, and that they favor the formation of a voting trust beginning November, 1916, and to endure for three years, or during the tenure of office of the present board of directors.

This would indicate that W. C. Durant's reported desire to merge

General Motors with Chevrolet had met with a decisive check.

The "round robin" to the stockholders was signed by the following directors: A. H. Wiggin, C. H. Sabin, C. S. Mott, S. F. Pryor, E. W. Clark, Thomas Neal, J. J. Storrow and Albert Strauss.



E. E. Stanford, Purchasing Manager, Westcott Motor Car Company.

PROMOTIONS IN GOODYEAR.

At the annual meeting of the Goodyear Tire and Rubber Company, Akron, O., the promotion of three individuals for the parts they have taken in the rise of the Goodyear product was a conspicuous feature.

Secretary G. M. Stadelman, who has been sales manager throughout the period of Goodyear upbuilding, was made a vice president. He continues as sales manager.

P. W. Litchfield, who has been with the company as factory manager almost since the beginning, was also elected a vice president.

A. F. Osterloh was elected secretary. He is also assistant sales manager.

BOSCH SECURES 18 CONTRACTS.

The Bosch Magneto Company advises that it has just closed contracts with 18 prominent concerns in the automobile and commercial vehicle fields to use Bosch magnetos for the coming season. The companies are:

Nordyke & Marmon Company, Indianapolis.
The Russell & Co., Massillon, O.
Croce Automobile Company, Asbury Park, N. J.
Bessemer Motor Truck Company, Grove City, Penn.
Harwood-Barley Manufacturing Company, Marion, Ind.
Diamond T Motor Car Company, Chicago.
Krebs Commercial Car Company, Clyde, O.
D. F. Poyer Company, Menominee, Mich.
Service Motor Truck Company, Wabash, Ind.
J. D. Fate Company, Plymouth, O.
The New-Way Motor Company, Lansing, Mich.
Signal Motor Truck Company, Detroit.
Zeitler & Lamson, Chicago.
W. W. Shaw Livery Company, Chicago.
Winton Company, Cleveland.
Transport Tractor Company, Long Island City, N. Y.
Old Reliable Motor Truck Company, Chicago.
Chester County Motor Company, Coatesville, Penn.

This makes 176 actual contracts for the exclusive use of Bosch magnetos obtained during the past season.

LOZIER IS PROGRESSING.

That the reorganized Lozier Motor Company, Detroit, is now being successfully managed is indicated by the report that a third dividend of 2½ per cent. on preferred claims against the company, which was adjudicated bankrupt a year ago, has been paid. This makes a total distribution of 12½ per cent. since the receivership, a sum of \$80,000.

Theodore Friedeberg, president of the Associated Lozier Purchasers, announced that the Michigan authorities have allowed the syndicate's petition to change the name of the Lozier Motor Company. He reports that the company is now manufacturing more cars than ever before, and that before the middle of January will be in a position to announce a capitalization of more than \$2,000,000.

It is understood that of the officers in the Associated Lozier Purchasers only President Friedeberg and Harry and Sam Frank will be retained.

PAYS CASH DIVIDEND.

The first cash dividend declared by the directors of the Autocar Company in a number of years was voted at a meeting held Dec. 28, 1915, the rate being at five per cent. and payable Dec. 31 to stock of record at the date of the meeting.

It was also voted that \$400,000 of the accumulated surplus be made permanent capital by issuing capital stock therefor. This adds materially to the financial

strength of the company, and it was in anticipation of this action that the company's authorized capital was increased on Oct. 14, 1915, from \$1,000,000 to \$2,000,000.

MORE PEERLESS MERGER PLANS.

In addition to the merging of the interests of the Peerless Motor Car Company and the General Vehicle Company, announcement is made that negotiations have about been completed with the maker of medium-priced cars whereby the engineering, designing, buying and selling will be combined.

One of the first results of the combination will be the development of a new type of car, worked out by the combined staffs and introduced to the market in competition with the cars of a higher grade. In view of General Electric interests in the merger, this is taken in some quarters as a hint that a new magnetic transmission product is coming.

Meantime the legal matters connected with the merging of the companies already in the arrangement are being worked out as rapidly as possible. The syndicate formed to underwrite the stock has completed its work and has been dissolved. This means that there are now no restrictions on the sale of the stock by subscribers. A distribution of cash and shares of the stock has been made by the syndicate managers.

Production at the Peerless plant in Cleveland is going forward rapidly and 50 trucks are being shipped weekly to the British government. A production of from 1000 to 3000 of the new eight-cylinder cars is also expected, the quantity depending on the extent to which the plant is occupied with war truck orders.

ANDERSON HUPP COMMERCIAL MANAGER.

Lee Anderson has been made commercial manager of the Hupp Motor Car Company and will have charge of sales, advertising and service. J. E. Field, formerly service manager, is sales manager and H. E. Westerdale is his assistant. Frederick Dickinson is advertising manager and his assistant is J. S. Patterson. Roy D. Heartz, formerly assistant service manager, is sales promotion manager, and J. L. Kenyon, formerly with the Cadillac company, is now service manager.

WILLYS AND JOY WABASH DIRECTORS.

John N. Willys, representing the automobile industry and the manufacturing interests of Toledo, and Henry B. Joy, representing the same interests in Detroit, have been elected directors of the Wabash railroad. In consequence thereof it is expected that the struggle between shippers and railroads over rate and traffic matters will begin to diminish.

The Standard Steel Car Company, Pittsburg, Penn., has taken over the properties of the Pittsburg Model Engine Company, which has plants at Pittsburg and at Peru, Ind., valued at \$1,000,000. The company plans a large output of cars and motors.

G. M. Montgomery, formerly travelling representative for the Bessemer Motor Truck Company, has been appointed to fill a like capacity for the Standard Motor Truck Company, Detroit, in its eastern territory.

SUGGESTIONS FOR THE FORD CAR OWNER.

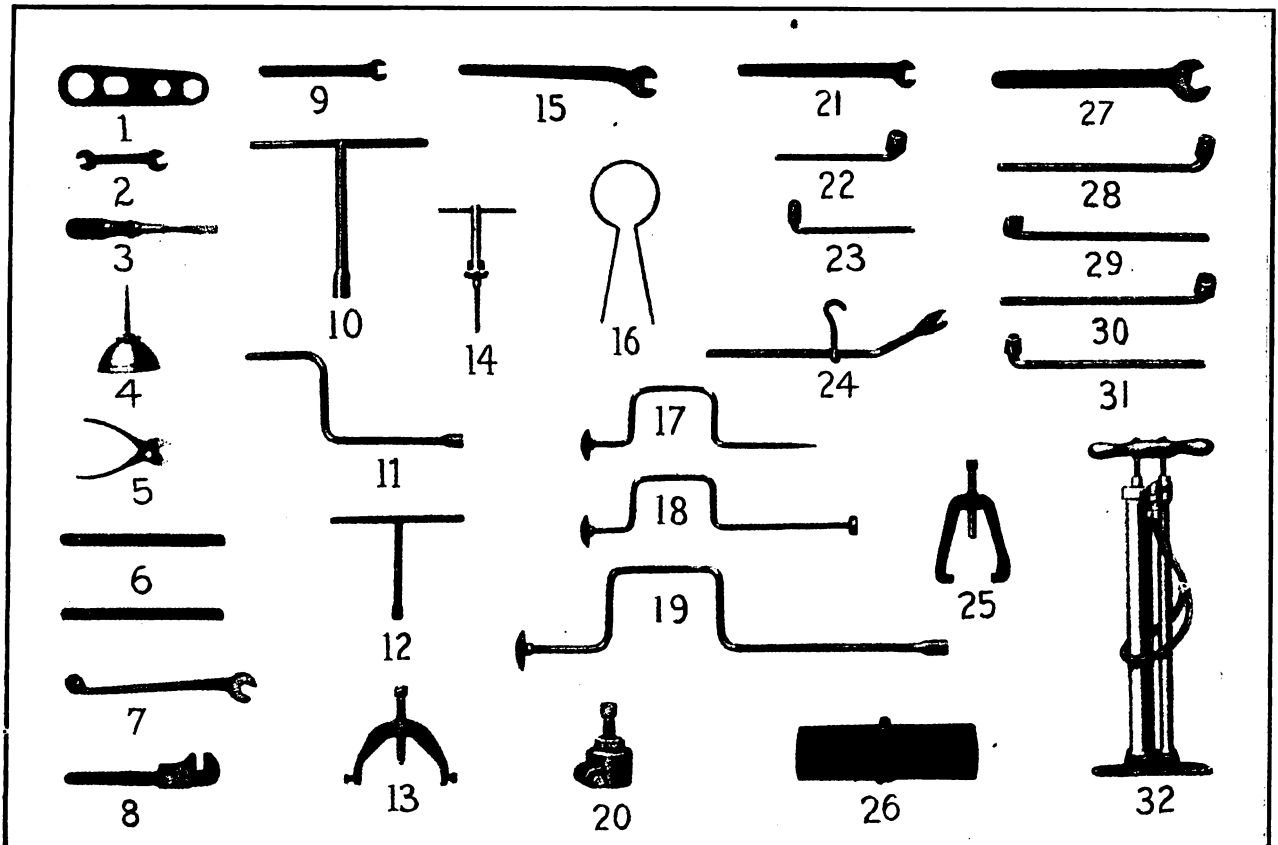
Tools Required for Ordinary Adjustments and Attention—The Standard Equipment and What Should Be Added to Do Average Work Economically.

The 39th article dealing with the construction, operation, maintenance, care and repair of the model T Ford chassis is devoted to general suggestions as to the garage facilities and tools that will be found useful by the driver or owner in the daily attention to and adjusting and repairing the machine.

WHEN a Ford car is bought the owner should examine it and learn just what tools have been supplied with it as equipment. If a car has been owned previously there is probability that

some tools have been acquired that were not sold with the machine, these having been retained because of the expectation that when another vehicle was purchased these would be useful.

Every manufacturer of a car supplies with the machine what is known as a tool kit, which generally includes a series of wrenches, screw driver, a pliers and similar small hand tools. some of



Tools Included in the Regular Car Equipment and Supplied for Special Use.

- 1—Hub Cap Wrench.
- 2—Double End Wrench.
- 3—Screw Driver.
- 4—Oil Can.
- 5—Pliers.
- 6—Set of Two Tire Irons.
- 7—Spark Plug and Cylinder Head Bolt Wrench.
- 8—Adjustable Wrench.
- 9— $\frac{3}{8}$ -Inch Open End Wrench.
- 10— $\frac{1}{2}$ -Inch T Socket Wrench.
- 11— $\frac{3}{4}$ -Inch Socket Wrench.
- 12—Screw Driver, Camshaft Set Screw.

- 13—Transmission Clutch Puller.
- 14—Valve Seat Reamer.
- 15—Flywheel Cap Screw Wrench.
- 16—Piston Ring Squeezer.
- 17—Magnet Screw Brace Screw Driver.
- 18—Valve Grinder.
- 19— $\frac{3}{8}$ -Inch Brace Socket Wrench.
- 20—Rear Wheel Puller Assembly.
- 21—Connecting Rod Clamp Screw Wrench.
- 22—Drive Shaft Housing Stud Nut Wrench for $1\frac{1}{2}$ -Inch Nut.

- 23—Rear Axle Housing Bolt Nut Wrench.
- 24—Valve Spring Lifter.
- 25—Cam Gear Puller.
- 26—Tool Roll.
- 27—Large Cam Gear Lock Nut Wrench.
- 28—Crankshaft Bearing Bolt Special Wrench.
- 29—Crankshaft Bearing Bolt Wrench.
- 30—Socket Wrench for Crankshaft Bearing Bolt.
- 31— $\frac{3}{4}$ -Inch L Socket Wrench.
- 32—Tire Pump.

which are specially constructed to fit the particular parts on which they are used, while others are standard products that are suited for general uses. There is a possibility that an expert mechanic with the tools provided could make the adjustments necessary on the machine, but he would undoubtedly advise the owner to obtain a number that would be specially adapted for differing works and with which much time and not a little labor could be saved.

Builders Furnish Few Tools.

Were car manufacturers to provide all the tools that could be made use of by the owners or mechanics the cost would be considerable for each vehicle, and the aggregate would be a prohibitive amount. For this reason the kit furnished is usually the few implements that are regarded as special with reference to the car itself, and several that may be used for a great number of purposes. The owner who has had experience will purchase immediately what he believes he can make good use of, and he will add others from time to time as the need becomes evident, but the man who has bought his first car will be lacking in knowledge of what he will require, and he may be so economically inclined that he will endeavor to do work without those he should have, depending upon the liberality of others who have made better and more complete provision than he.

The theory that one can do a work without tools, however, is much the same as endeavoring to use a row boat without oars. They are not of much value until they are wanted, and then they are absolutely necessary. A very trifling work may be imperative, but without the tool with which this can be done the machine will be useless, and time will be lost and much needless delay caused. This statement is not made to advise that an owner purchase a great variety of tools, but to emphasize that there are some that ought to be obtained without delay.

Kit Will Depend on Owner's Interest.

Relative to the selection of a series of tools, this is a matter of judgment that is more or less dependent upon the intention of the owner. If he purposes to do his own work then he ought to have whatever equipment is necessary and can be used to good advantage, while if he intends to have the service station, the agency or a repairer make the adjustments and repairs, he will have a need for but few more than is supplied with the car.

But the advice that will be given assumes that the owner intends to do his own work so far as it can be done with facilities that can be installed

in a small garage, and that he desires to obtain what will be of service in making every adjustment and repair up to and including an overhaul. Economy may be one reason for this purpose and interest in mechanics may be another, or perhaps both may be the incentive. Of course much depends upon the manner of keeping the car. If it is kept in a public garage in what is known as "live storage," where no attention whatever is given and washing and cleaning is done as ordered, the owner may have no place for keeping his property outside of the car.

Provision for Storing Property.

Some public garages make provision for such customers, however, and have lockers that may be rented and in which tools and supplies may be kept. With a machine housed in such a garage better equipment could be obtained. Where a car is stored in a private garage that the owner occupies exclusively, he can fit it as he pleases, and if two or three owners share a garage they can, if they are of the same mind with reference to economy, proportion the expense and have the use of thoroughly complete equipment. One cannot well advise what would be practical for all conditions that may be met with by the owners. Each owner must make plans that are best adapted for the uses he makes of his machine and the manner in which he maintains it.

For the purpose of describing the work that ought to be done and the facilities necessary for doing it, the car will be assumed to be in a private garage, which can be heated sufficiently to be comfortable in severe weather, and so lighted that one may undertake any adjustment or repairing either by day or night. One must understand that this does not presuppose a pit is available, but water, light and heat are convenient. What might be regarded as necessary in a repair shop, for instance where repairing is done constantly, cannot be considered for the private garage for two reasons, the one being the expense and the other the limited space.

Garage Should Have Good Area.

No garage ought to be built so small that it will merely house a car. It ought to have sufficient room for a sizeable bench and floor space that will allow working on either side and ahead and behind the machine, because when a work like an overhaul is undertaken a considerable area will be required if time is a matter for consideration. Unless the building has reasonable space one had better find a place where overhauling can be done conveniently, because working will be much retarded by unfavorable conditions.

With reference to the garage, this ought to be so constructed that it can be ventilated should there be occasion to run the engine of the car for any length of time. The air in a comparatively small structure, such as would serve for garaging one or two cars, would become vitiated very quickly from the exhaust gas. The gasses resultant from combustion of fuel gas are noxious to an extreme and will quickly and seriously affect a person inhaling them. The fuel gas, when wholly or partly consumed, will be transformed to carbon monoxide and carbon dioxide, two gasses that are heavier than air, and which will accumulate and gradually displace the atmosphere in a closed room or building.

Dangers from Combustion and Fuel Gasses.

Both gasses are colorless and odorless and their accumulation would not be noticeable. When created they are precipitated by weight to the lowest level and then accumulate in the same manner as a reservoir is filled with water. While the gasses are accumulating the air above the gas may be breathed and one has no knowledge of the existence of the asphyxiating gasses, which may be inhaled unknown by a worker. The only indication of danger would be the sensing of vitiation of the air and possibly slight dizziness and a realization of the difficulty of breathing.

The gasoline gas or vapor, as the fluid volatilizes, accumulates in precisely the same manner, it being heavier than air and displacing it from the lowest level. Gasoline will volatilize or evaporate freely when exposed to air, but the degree of evaporation is variable with the temperature, increasing or decreasing with the rise or fall. Carbon monoxide or carbon dioxide will in the ordinary manner of accumulation extinguish flame, although they are resultants of combustion, but gasoline vapor is extremely inflammable when combined with varying proportions of air. With the former gasses there is the one danger of asphyxiation, but with the latter there are the combined dangers of asphyxiation and explosion and fire.

Good Ventilation and Lighting.

The certain preventive is good ventilation. The gasses can be moved by brisk circulations of air, and if accumulated in pits, for instance, can be dissipated by fanning or by continuous blasts of air, as from an electric fan, but unless they are so dealt with they may remain a source of danger for considerable periods, as they cannot be taken up by the atmosphere as are lighter gasses that will combine with it. Where internal combustion engines are permanently located in buildings

to supply power they are exhausted into the open air. Because of the inconvenience and expense of connecting the exhaust pipe of a car so that it will discharge outside of the garage, some other manner of ventilation must be provided.

The lighting should be done electrically if possible, because this is far safer than when open flame lamps are used, and with cables lights can be carried wherever desired and placed so that work can be very accurately done. Even with the best of day lighting by windows there is probability that much of the work will be done during the nights, and a sufficient number of lamps ought to be provided.

Equipment of the Garage.

The equipment of the garage will depend wholly upon the desires of the owner of the car, but the floor area and the work bench should be as generous as can be provided, for these will be found extremely serviceable and will amply return whatever investment may be necessary to obtain them. Storage space is particularly desirable and the advantage of having it where it will be convenient will be the better realized with experience. The value of system in the arrangement of the tools is well enough known so that this detail need not be given more than passing mention. There is every reason to have small bins and drawers and racks and hangers, for these will serve a very useful purpose wherever located, and they will economize time very generally.

Reference has been made to the tools that will be required for the ordinary adjustments and attention to a car, some of which will be found included in the kit supplied with the machine. But while there are few of these, a considerable number is really necessary—so necessary in fact that the Ford Motor Company either manufactures or obtains them in quantities, and keeps them in stock to supply singly or in a special set to meet any requirement.

Special Tools for Ford Cars.

In the accompanying illustration the entire set is shown, and each tool is designated by a number. This does not, of course, show the designation by which each tool is known to the Ford Motor Company, but it is possible with it to follow sequentially through the assortment prepared by the company, and with the names the order numbers can be obtained from the parts catalogue, where they will be listed under the caption of "special tools." The series is especially desirable and it can be obtained for a comparatively small expenditure. To purchase such tools singly would cost considerably more and no

greater satisfaction would be obtained.

Of these tools the greater number are intended to be carried in the car, but some of them would not be needed for ordinary adjustment and nothing would be gained were they included in the tool box outfit.

The usefulness of these tools can only be learned by experience, for with them work can be undertaken that would be, no matter how extended the experience of the owner as a mechanic, taken to a repair or machine shop, and which might in one work save much more than the purchase price of the set, to say nothing of the insurance against delay and loss of the service of the vehicle.

Not only will the tools be always available, but they will serve for a very long pe-

pool recently built by Carl Fisher, president of the Prest-O-Lite Company, and the Indianapolis Speedway, and founder of the Lincoln and Dixie highways, is shown in the accompanying photograph. The car in the view is the National Highway 12, so named because the National highway projects, like the car, originated in Indianapolis.

Mr. Fisher's tennis court is said to be the finest enclosed court in the United States.

PREMIER ISSUES PROSPECTUS.

The reorganized Premier Corporation has issued a financial prospectus. Nothing is said concerning the car or cars it is to produce, but attention is given to the personnel of the new company and its financial standing. The corporation starts with a clean slate and is not bound by any previous policy. The business will be conservatively conducted and the car will be a high quality product, "manufactured first and priced afterwards."

The new officers are Joseph C. Flowers, president; E. W. Steinhart, vice president; F. W. Woodruff, treasurer; C. F. Jensen, secretary. Directors: George Woodruff, president of First National Bank of Joliet, Ill.; Harry L. Thompson, secretary of the Gerlach-Barklow Company, Joliet; Theodore R. Gerlach, vice president of the Gerlach-Barklow Company; C. F. Jensen, president of Van-

guard Manufacturing Company, Detroit; F. W. Woodruff, banker of Joliet; Joseph C. Flowers, E. W. Steinhart and F. E. Smith of Indianapolis.



Tennis Court Building on Estate of Carl G. Fisher of Indianapolis, Founder of Lincoln and Dixie Highways—As the National Highway Idea Originated in Indianapolis, It Seemed Altogether Proper That the New Indianapolis-Made National 12-Cylinder Car Should Be Named for National "Highway" 12.

riod and will be equally valuable with any Ford car that may be owned.

(To Be Continued.)

CADILLAC OUTPUT SOLD OUT.

As the year's output of eight-cylinder Cadillacs was contracted for by dealers some time before the New York show, the factory representatives did not do any business there. However, the dealers in the metropolitan district and other eastern territories made many sales. Some are reported to have already exhausted their allotments and to be clamoring for additional cars.

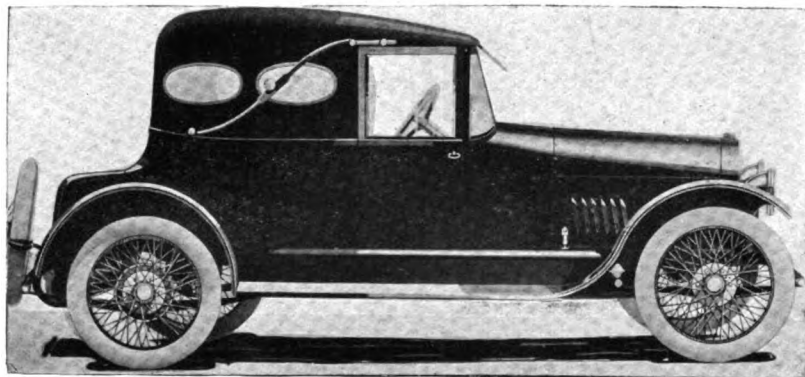
CARL FISHER'S PLAY GROUND.

The new enclosed tennis court and swimming

The great popularity of the Kissel All-Year car, which was introduced last year and was shown at the New York and Chicago shows, has made the Kissel Motor Car Company the largest producer of closed cars in the United States. The Kissel All-Year car was the first to be equipped with the detachable body. It has been imitated since by a great many makers.

The Georgia House of Representatives has passed a graduated tax on automobiles providing for rates of from \$3 to \$6 on each. The returns will be used for road construction.

DETAILS OF ABBOTT-DETROIT MODEL 6-44— UNIQUE REAR SYSTEM USED.



AMONG the outstanding mechanical features of the new Abbott-Detroit model 6-44, produced by the Consolidated Car Company of Detroit, is the employment of a rear system that requires 84 parts less than in former Abbott-Detroit models. This system does away with the use of radius rods and rigidly connected torque tube, the rear ends of the rear springs being used as draw bars to propel the car through the back end of the frame, instead of pushing through the springs, as has been conventional practise.

The springs are long and under normal load are nearly straight. The rear set hinge at their rear ends, and are shackled free at their front ends. The result claimed is a more responsive spring action.

The new model is a large and commodious product, but much lighter than the average high-grade car in the same class. It sells at prices that are exceedingly moderate in view of the completeness and comfort supplied.

The new chassis has a Continental six-cylinder motor with a detachable head. The bore is $3\frac{1}{4}$ and the stroke $4\frac{1}{2}$ inches, and the cylinders are cast en bloc. The entire block is extremely easy of access by removing the cover casting, which forms the cylinder heads, water jacket and water manifold.

There are three main bearings, which are easily reached by removing the oil pan from

the frame of the motor. The valves are located on the side. The carburetor is a Zenith type, which is fed by the Stewart vacuum system. The camshaft is driven by spur gears.

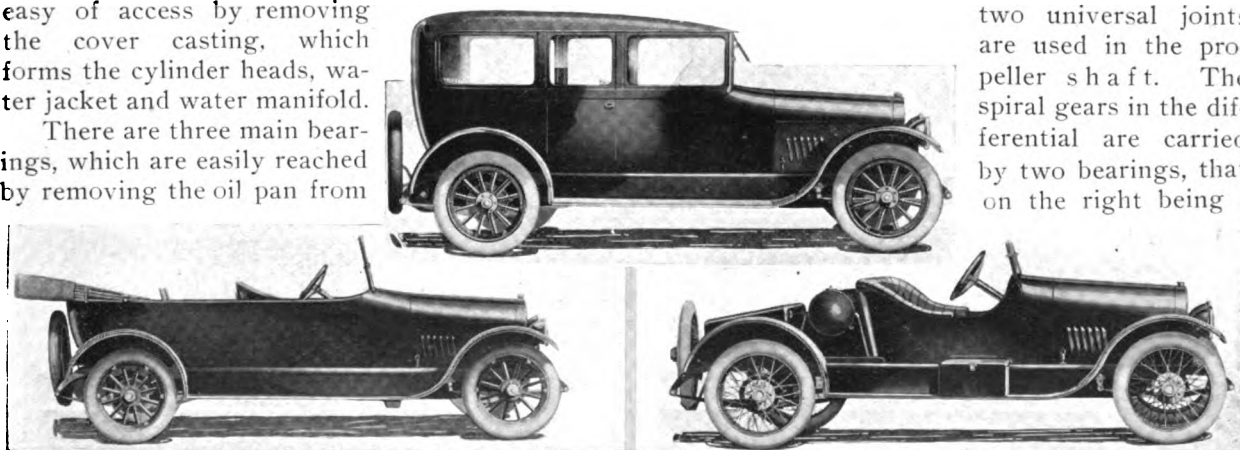
Lubrication is by the force feed and splash system, the oil being forced to the main bearings and the other working parts of the motor being lubricated by splash. Cooling is by water circulated by a pump and aided by a fan, as in conventional practise.

The power plant is a single unit, containing the whole of the motor, the clutch, transmission, control and brake levers, and the set of foot pedals. The starting motor is connected directly with the flywheel housing.

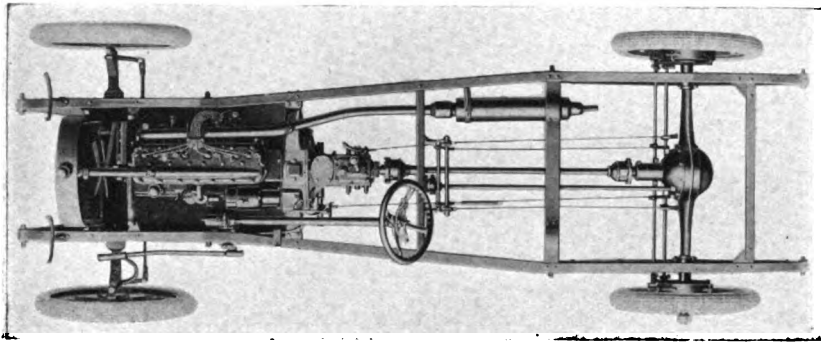
Remy ignition, with every wire in a metal conduit and each a different color, has been adopted. The distributor and coil are mounted integral with the generator.

The clutch is a three-plate type with liberal friction areas. The flywheel is supported by universal type bearings. All bearings of the transmission are of the spiral roller type. The gears are of chrome vanadium steel, triple heat treated.

With the drawbar spring drive construction, two universal joints are used in the propeller shaft. The spiral gears in the differential are carried by two bearings, that on the right being a



Four Abbott-Detroit Body Types, Mounted on the 6-44 Chassis; at Top of Page, the Motor Coach; Topmost Car in the Group, the Five-Passenger Sedan; Bottom, Left to Right, Seven-Passenger Touring Car and Speedster.



Plan View of the Abbott-Detroit 6-44 Chassis.

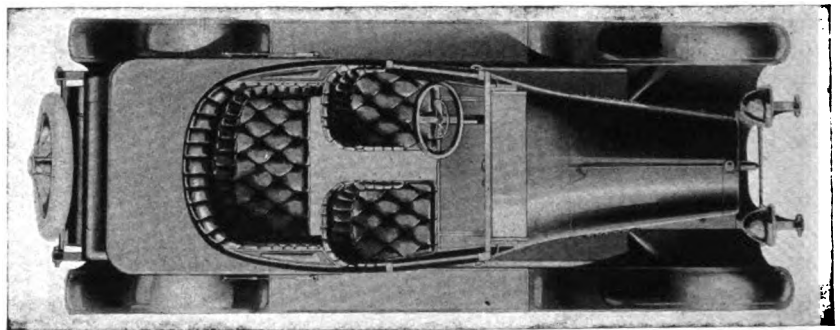
Bower roller type and on the left an annular 90 per cent. thrust type, which gives what is considered proper support to the drive gear. The drive pinion shaft is carried on two sets of bearings. The supports for the differential bearings are integral with the drive pinion shaft housing, which insures positive rigidity and maintenance of the gear arrangement.

The frame is made from a special grade of highly refined, low carbon steel, and is liberally provided with cross members and struts. At the rear the frame is widened so that spring bushings are close to the wheels, and at the front the rails are sufficiently close together to provide a short turning radius. The wheelbase measurement is 122 inches.

On this chassis five types of bodies are mounted: A two-passenger speedster, priced at \$1195;

plete set of tools and repair kit.

The body of the seven-passenger touring car is finished in black. The wooden wheels are cream colored. Standard equipment includes a one-man top and envelope, sloping windshield,



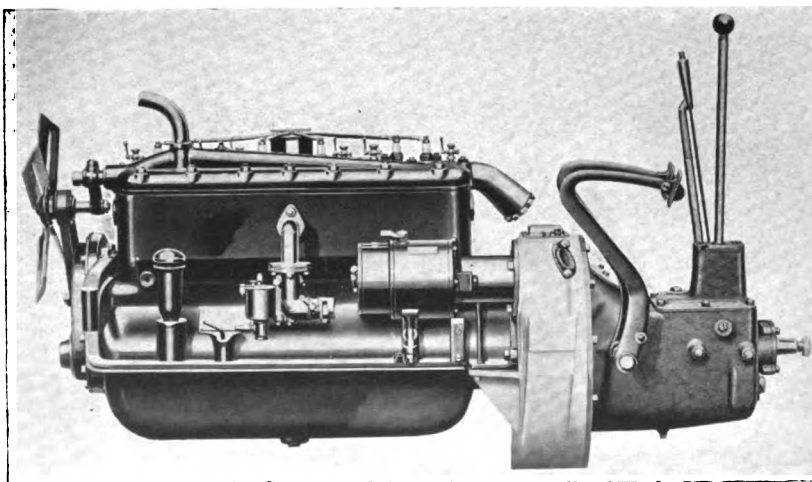
Seating Arrangement of the Abbott-Detroit Motor Coach and the Close Coupled Roadster.

robe and foot rails and 32 by four-inch tires, non-skid in the rear.

The four-passenger motor coach's body is finished in black with white enamel wire wheels.

Other features of finish are standard trimming of black leather in upholstery and bright finished, long grain, first quality coach leather for the top. Equipment includes a sloping, adjustable glass front, one extra wheel, headlights of the double bulb style, dome light, dash and trouble light and 33 by 4½-inch tires.

The four-passenger roadster has the same specifications and equipment as the motor coach, with the exception that the windshield and top are of the regular open car style, and the wooden wheels carry 32 by

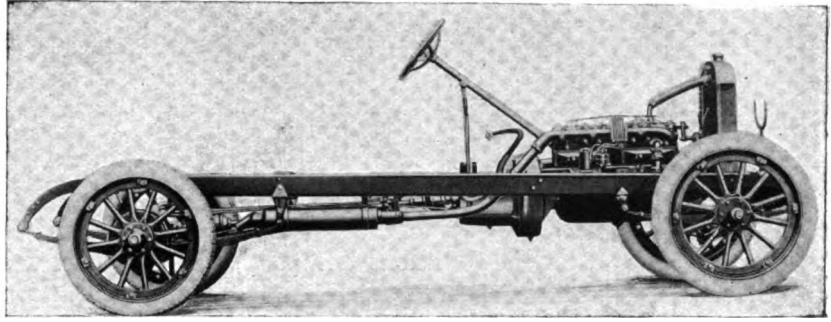


Left Hand Side of Continental Motor Used in Abbott-Detroit 6-44 Chassis.

four-inch tires.

The body of the five-passenger touring sedan is finished in black; the wheels are wooden and cream colored, carrying 33 by 4½-inch tires, non-skid in the rear, with same standard equipment as the open types and including headlights of double bulb type and dash and trouble light.

The speedster body is finished in bright red and white striping. It is equipped with five white enamelled wire wheels, one being supplied as extra, and carrying 32 by four-inch tires, non-skid in the rear. In addition to the equipment mentioned for this type of open body a motometer is



Side View of Chassis, Showing Drawbar Spring Construction on Abbott-Detroit 6-44 Model.

an individuality of its own. There is a small lake partly in the grounds and a park with tennis courts. Football, baseball and swimming equipment was also supplied.

About 1000 people now reside on the heights and there is a school, church, stores and all the usual enterprises of that sort. The plan has been so successful that many manufacturers from several parts of the country have investigated it.



General Layout of Rear Assembly.

supplied as standard equipment.

The manufacturer calls particular attention to the comfort and luxury to be found in the fittings and equipment of all models, such as the deep upholstery of real leather and the numerous mechanical features, power and flexibility of motor.

GOODYEAR HEIGHTS PART OF AKRON.

Goodyear Heights, the plot of 100 acres near Akron, which was bought, sewered, improved and had homes built upon it for workmen in the Goodyear factories, has become so populous that the city of Akron has passed an annexation ordinance to include it in the city limits.

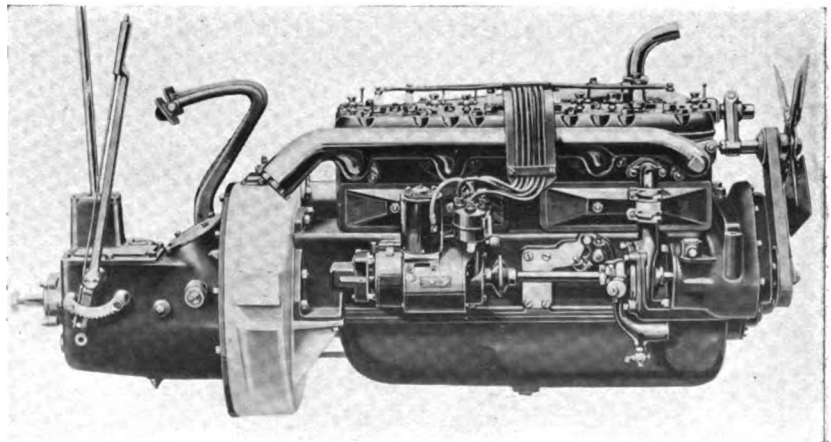
The plan was adopted to permit Goodyear employees to buy homes without the usual "down payments." The houses were built by the company and the men allowed to buy them merely by paying rent without any large initial payment.

Unlike most allotments of the sort, the houses are not all of the same kind, but each has

CLUBS AFTER FAKE LEAGUES.

The American Automobile Association and many of the larger automobile clubs are opening a campaign against "motor leagues" and other similar organizations that assure motorists whom they solicit that membership will permit them to buy supplies and accessories at less than the regular price. Some of these leagues have been found to use very shady methods and seldom deliver the service that they promise.

Motorists are being urged to tell their experiences and aid in prosecutions where the facts make them possible.



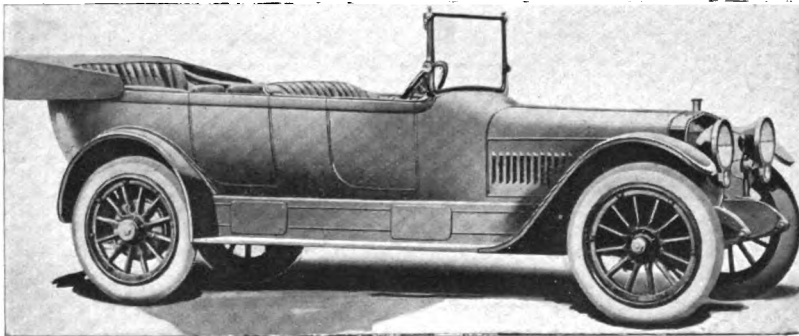
Right Hand Side of the Abbott-Detroit 6-44 Motor—Note Filber Shield Protecting Ignition Terminals.

TWO WINTON SIXES FOR 1916.

Models 48 and 33, Both Six-Cylinder Chassis, Will Constitute the Complete Line for This Year—Prices Are \$2285 and \$3500.

FOR the year 1916 the Winton Company, Cleveland, O., will make only six-cylinder chassis, these being in two sizes, which are designated as models 48 and 33. While these are new models, they show no radical departures from Winton practise of the past, which has given eminent satisfaction.

Model 48 embodies a six-cylinder motor having a bore of $4\frac{1}{2}$ inches and a stroke of $5\frac{1}{2}$ inches and an N. A. C. C. horsepower rating of 48.6. The motor of model 33, also a six-cylinder type, has a bore of $3\frac{3}{4}$ inches and stroke of $5\frac{1}{4}$ inches and an N. A. C. C. rating of 33.75. Both have low suspension and all moving parts are fully enclosed. The following mechanical description applies to both chassis, except where mentioned as otherwise.



The New Winton Six-Cylinder, Seven-Passenger Touring Car, Model 48.

Cylinders are cast in pairs, and each individual cylinder is surrounded by a water jacket. New design piston rings are used. Hardened tool steel has been used in the manufacture of the piston pins. The valves are all on one side, the valve springs, plugs and plungers being covered by steel plates that are readily detachable. Cams and the camshaft are one piece forging, and the cams have been given a profile so as to make the flow of gas proportional to piston speed. The camshaft can be removed through the front of the case without the necessity of removing valves, springs, push rods or rollers.

Quiet drive of camshaft, magneto, water pump and generator is assured by use of an enclosed silent chain. The crankshaft is of specially

treated steel with all bearing surfaces ground. It is carried in four bearings bushed with Parsons' white brass. The crankcase is of aluminum and is divided into upper and lower halves, with all bearings in the upper half. The case is equipped with a breather.

Both models employ a two-unit Bijur electric starting and lighting system and Bosch magneto. The carburetor is a special design Rayfield, water jacketed, with hot air supply and dash control. Lubrication is by force feed, the pump being driven by spiral gears and taking the oil through a screen in the lower crank case and delivering it through a tube cast within the case to the main crankshaft and camshaft bearings, and through conduits drilled in the crankshaft to the connecting rod bearings, and also through a tube to the front chain.

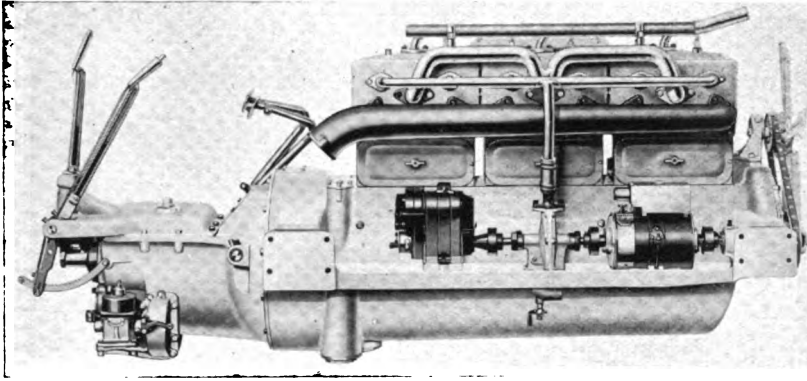
Chain driven centrifugal pump assures positive circulation of water. There is a honeycomb radiator and large fan surrounded by a shield. The clutch is a dry plate type with 17 discs, nine of which are attached to the transmission shaft and eight to the drum bolted to the flywheel. The gearset, which runs in oil, offers four speeds forward and one reverse, with direct drive on third speed

through internal and external gear combinations.

The front axle is an Elliott type, and the rear axle of the full-floating type. Driving gears are spiral bevel, the bevel differential running in oil nickel steel gears and pinions, and Timken roller bearings throughout.

The rear springs, which are three-quarter elliptic, are underslung and made of chrome vanadium steel. They act as radius rods, having no forward end shackle, and are suspended outside the frame rails. Front springs are semi-elliptic and all springs are equipped with Dann cushion inserts.

Cowl board, lighted by electric light, carries electric lighting switch and ammeter, carburetor control, speedometer, clock and ignition switch.



Right Hand View of the Winton Six Unit Power Plant.

Model 33 is a five-passenger car, while model 48 is a seven-passenger. Hinges on both are concealed, and the front floor is aluminum covered. Divided front seats are optional in the five-passenger model and the tonneau of the seven-passenger is lighted by electricity.

Winton bodies are made in the company's own plant and for 1916 a wide range of choice is offered. The standard line includes four and six-passenger touring, roadster, coupe, sedan, landaulet and limousine types, while colors are optional. Model 48 has five by 37 tires, and model 33 has 36 by 4½ tires. The wheelbases are 138 and 128 inches respectively for the two models.

Model 48 is offered in runabout, or four, five, six or seven-passenger bodies for \$3500. Model 33 with runabout, four or five-passenger touring car types costs \$2285; a six-passenger body sells at \$2435 and a seven-passenger at \$2355.

SELECTING THE RIGHT OIL.

Changes in lubricating oil should be made with regard to the condition of the motor and the amount of compression it has lost through wear, rather than on account of temperature or weather, according to C. N. Goward, president of the Eagle Oil Company of Boston, distributor of Eagleine lubricants.

A new motor has as near perfect compression as possible, said Mr. Goward, but after it has been driven some thousands of miles mechanical wear takes place. When it is new a light oil should be suitable, regardless of the weather, since the temperature in the motor when it is

in operation is about the same. After it has worn considerably and the clearances are greater a medium light grade should be used.

Mr. Goward believes that the lubrication charts based on the kind of oil to use, which are based on differences of weather or temperature, are founded on the wrong principle. The real distinction should be the amount of wear that has taken place in the motor.

With this in mind his company has prepared a chart for different models of cars and showing the right oil to use according to mileage. This he believes gives the best results since it adapts the oil to the compression of the motor.

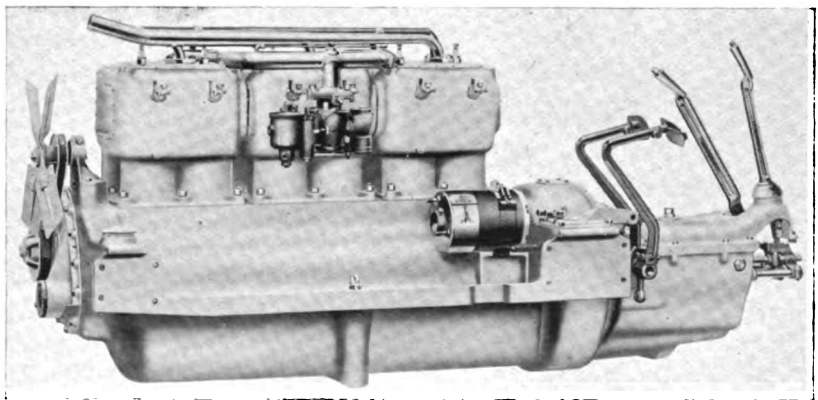
The chart is sent on request to any motorist.

SHOCK ABSORBER CHART ISSUED.

"A Guide to Riding Comfort" is the title of a chart that has just been issued by the Hartford Suspension Company. It indicates the size and type of shock absorber that is suited to every model of every make of car that has been turned out since 1913. The list includes 122 makes and more than 250 models.

LOCOMOBILE INSTRUCTION BOOK.

An instruction book covering Locomobile cars from 1909 to 1915 in one volume has recently been issued by the Locomobile company. The index is cleverly arranged so that all reference, except that to the car which the owner drives, may be crossed off and only the items of interest to him



All Moving Parts of the Winton Motor Are Enclosed.

remain. The combination book is made possible by the fact that there have been few radical changes in Locomobile construction for many years—the cars have continued fundamentally the same with only minor changes.

CHALMERS IDEA CONTEST.

Four thousand employees of the Chalmers Motor Car Company gathered at a great mass meeting on Dec. 23, when Hugh Chalmers announced that for the best money saving idea turned in by an employee of the rank and file during the next six months, a Chalmers six-cylinder car would be given. He also announced that in the future the company would pay for all such suggestions that were made. The contest was

BOSTON SHOW SPACE IS TAKEN.

There has been an unprecedented and unexpected demand for space at the Boston show, which is still two months away, and every inch of the six acres of floor space in Mechanics building has already been contracted for. There are a score of commercial passenger car and accessory makers still clamoring for space.

Had Manager Chester I. Campbell been aware of the demand a separate truck show would probably have been held, instead of the combined exhibit scheduled. The advisability of securing additional buildings for the display is now being considered.

The first floor of Mechanics' hall is entirely taken up by trucks and consequently a number of passenger cars that have hitherto been shown



Flashlight View of the Gathering of Chalmers Employees When the Prize Winners of the Idea Contest Were Announced and the Prizes Distributed.

started in July, 1915, and since then more than 6000 suggestions have been submitted.

The prizes for the ideas already submitted were distributed by Vice President Pfeffer. M. S. Gibson, advertising department, got \$100; A. G. Swords, inspection department, \$50; B. E. Keeler, service department, \$50; Lewis Williams, finishing department, \$20; Nicholas Spader, inspection department, \$20; H. Stahl, paint department, \$20; Charles R. Slusser, final test, \$20; J. J. Coleman, motor block test, \$20.

During the evening motion pictures of the factory showing the employees at work in various departments were shown and then the floor was cleared and there was a dance. The company gave 3000 boxes of candy to the girls who were present.

have been crowded out. Paul Revere hall, which has formerly been occupied by passenger cars, has been given over to accessories. A month after the reservations were opened all of the accessory space was taken.

Walter E. Flanders, president of the Maxwell Motor Company, declares that the motor car will be of the greatest use in the next war in which the United States may be involved. He points out that many places where a landing could be made on our coasts are not reached by railroads, but can be reached by country roads. Motor car manufacturers, if given two months' notice, he says, could turn out enough light cars to enable an army of 250,000 men on either coast to shift its position 500 miles in 24 hours.

PRACTICAL MOTOR CAR REPAIRS.

TOOLS left about the shop often become so scattered that much time is wasted in trying to find them when needed. A simple and easily

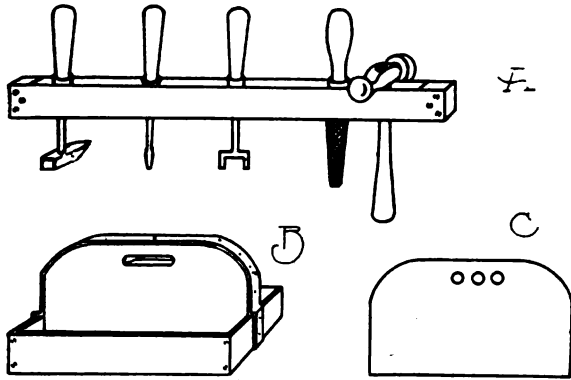


Fig. 130—A, Simple Tool Holder; B, Easily Constructed Tool Box.

made holder is shown in Fig. 130 A. It consists of two pieces of sheet metal, which are $\frac{1}{8}$ -inch in thickness and as long and as wide as desired. A block of wood is inserted between the plates at either end, and holes are drilled to allow the device to be fastened to the wall by long screws. The holder is for such tools as screwdrivers, files, valve wrench, hammers, etc.

EASILY CONSTRUCTED TOOL BOX.

Everyone doing garage work on automobiles should, for convenience at least, carry the tools in a small tool box. Many types of metal cases can be purchased at a reasonable price, but one constructed of wood can be made easily and cheaply, as shown in Fig. 130 B. It should measure about 16 inches in length, 12 inches in width and four inches in height. The handle can be made from a solid piece of wood in the shape shown in Fig. 130 C. The hand hole is made by drilling three holes on a parallel line and then cutting the slot with a knife or chisel. The handle is then placed in the centre of the box and fastened at the ends and bottom by wood screws. To re-enforce this part, a piece of band iron can be carried over the handle and down the opposite sides.

REPAIRING LEAKY RADIATOR.

During this season of the year motorists sometimes forget to drain the water from the cooling

system, or else to provide an anti-freezing solution. The parts of the car to be damaged first by this procedure are the small vertical tubes in the radiator. Of course the only proper method of repair is to have the pipes soldered by an expert workman. However, a temporary repair, and often a permanent one, can easily be made as shown in Fig. 131. After determining the area of the leak, drain the water from the system and with the blade of a knife, or a pointed stick, force a paste made of a good grade of Portland cement through the honeycomb construction to the point of leak. The paste will harden quickly and is practically indestructible. If the break is large this repair is not advised for the reason that the cement prevents the air from circulating around the pipes and results in rapid overheating.

FORCING OUT AXLE TUBE.

The rear assembly of the Autocar delivery car is of the full floating type, the rear wheels riding on axle tubes forced into the housing. Easily made equipment for removing these tubes is shown in Fig. 132. It consists of two flange members, A and B, and the two screws C. The centre hole in the flanges is of clearance size for the axle tube. The end holes of flange A are drilled and tapped to take the screws, while the holes in flange B are not drilled through the metal but merely serve as pivots for the ends of the screws. The application of the apparatus is

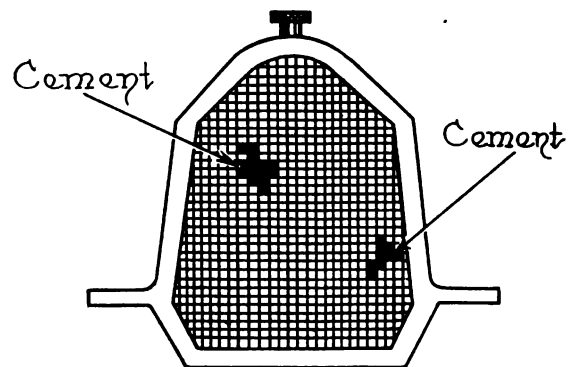


Fig. 131—Repair of a Leaky Radiator.

shown in Fig. D. Flange B is first placed over the axle tubing and against the housing. The screws are then passed through flange A and

the wheel lock nut placed at the end of the tubing. The action is simple. By screwing down on the two screws, flange A is compelled

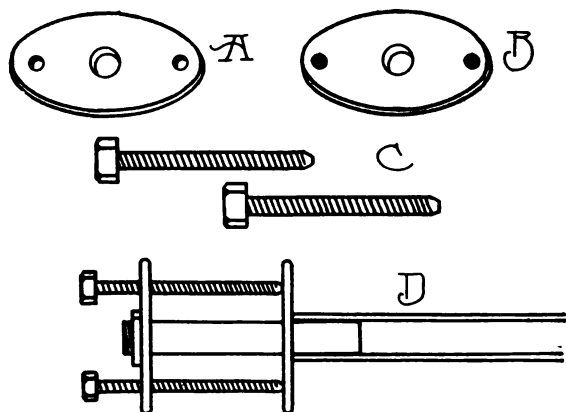


Fig. 132—Forcing Out Axle Tube.

to move out and against the lock nut and thus gradually force the tubing out of the housing.

PROPER WAY TO LACE A BELT.

A properly laced belt, which will insure smooth running, maximum power with minimum trouble, and long service, is an important factor in machine shop practise, and every garage man using belt driven machinery should give the subject due consideration. The sketches in Fig. 133 are based upon the methods employed in large industrial plants.

The ends of the lacing should be trimmed, as shown at A. The holes to receive the lacing should be punched in a double row and approximately in the relative positions shown at B. So that these holes may be in alignment, it is best to draw a guide line with a sharp instrument before punching.

To make the lacing method as clear as possible, assume that the rows of holes shown at B and C, are numbered from 1 to 4, from top to bottom. Start the lace through the holes of rows 1 and 4, as shown at C, and then bring the end from row 4 to the hole in row 2, that is second from the right hand edge of the belt. Next in order is the end hole of row 4, then to the end hole of row 2, back to end hole in row 3, next to the end hole of row 1, and to the hole second from the right edge in row 3. Both ends of the lacing should be woven through their respective holes alternately, until the result shown at D is achieved.

The next operation is to anchor the ends. Four holes should be made in the belt, two at the top and two at the bottom, and in the relative po-

sitions shown at E. The anchor holes should be punched and not cut, for the contraction of the leather would tend to bind the lacing. Thread the lacing through these holes, as shown, and secure by cutting notches in it near the surface of the belt. Twist the end of the lacing a quarter turn. The result should be as shown at E.

BRIGHTENING LEATHER.

A simple but efficient method of brightening leather upholstery is to rub it well with a piece of soft cloth moistened with the white of an egg. The egg should be strained to remove any stringy matter. A dry, soft cloth should be used for the final rubbing. This will remove all traces of the egg and give lustre to the leather.

REPAIR OF CRACKED CYLINDER.

Though the only thoroughly satisfactory permanent repair for a cracked water jacket is to have it welded by the autogenous method, a temporary repair can be effected by making a rust joint. Make a rather strong solution of sal ammoniac in hot water, and pour it into the jacket so that the crack is completely covered, and allow to stand for about 24 hours. If the edges of the broken metal are close together the joint will remain tight for quite a long time.

PACKING A WATER PUMP.

Although it may be considered a simple matter to repack a water pump, it will be well to note that there is a right and wrong method of apply-

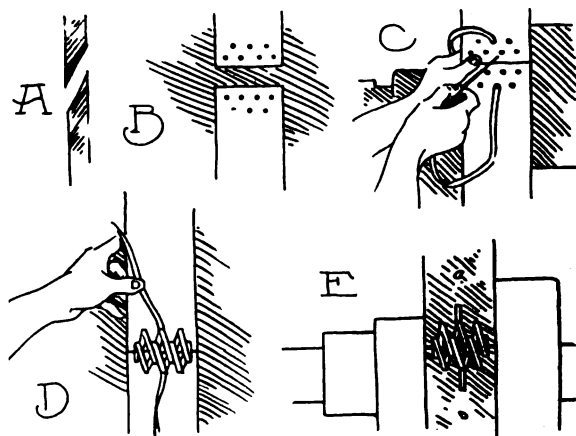


Fig. 133—Proper Way to Lace a Belt.

ing the packing. Rope packing is extensively used for this work. Cut off the correct length to be used and then turn off the packing nut and

remove the old packing. As this nut is usually machined with a left hand thread, the packing should be wound on shaft as shown in Fig. 134.

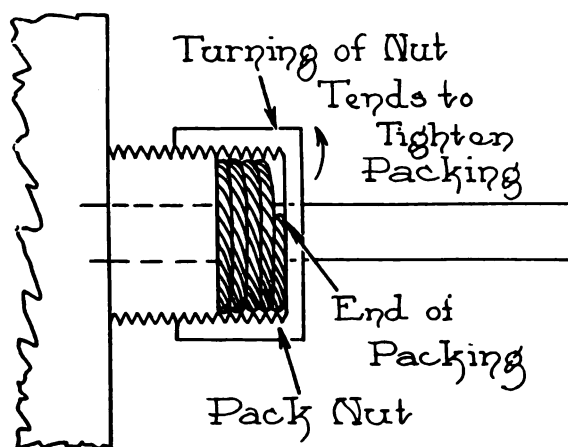


Fig. 134—Packing a Water Pump with Rope.

It is obvious that when the nut is screwed on, the packing remains compact and thus makes a good joint. Should the packing be placed in the reverse of the direction of wind shown in Fig. 134, the tightening of the nut has a tendency to drag back the ends and loosen the packing, which will result in a leaky joint.

CARE OF STORAGE BATTERY.

This is the time of the year that difficulty is liable to be encountered in starting the engine. When the car is equipped with an electric starter, continuous spinning of the motor will soon run down the storage battery. A sure method of preventing extra taxation of the battery is to provide some reliable priming arrangement.

The chief duty of the motorist is to determine that the battery is fully charged and that the electrolyte fully covers the battery plates. There is no danger of a fully charged battery freezing. The specific gravity should be tested by a hydrometer at least once every two weeks. The reading should range between 1.250 and 1.300 at all times. If this condition does not exist the motor should be run at generating speed for a considerable period or the battery should be charged by an expert. When proper care is accorded the battery the only work necessary should be the adding of distilled water. This water evaporates and must be replaced.

DRIVING PINS AND SHAFTS.

A metal shaft or pin should never be driven in by direct blows of a steel hammer. This

method is almost certain to upset the end of the driven part. A much better method is to place a piece of brass or babbitt on the end of the part and strike that with the metal hammer. Too much care cannot be exercised, as most parts of the automobile are accurately finished and fitted and are liable to be injured.

TIGHTENING NUTS AND BOLTS.

It will be well to bear in mind that less force is required to securely tighten a screw or nut having fine threads than is required to tighten one having coarse threads. Therefore, great care should be taken in tightening them, as the threads may be stripped under a strong pull.

TELEPHONE ARRANGEMENT.

A garage having but one telephone and not wishing to have the workmen enter the office to use it, has adopted the arrangement shown in Fig. 135. It consists of a box built into the office partition. This box is provided with two sliding covers, one at the office side and the other at the shop side. The telephone is placed in the box as shown and may be used with the privacy of separate telephones.

LEFT HAND THREAD CUTTING.

It is often necessary to cut left hand threads on brake, radius or other rods when a left hand die is not available. Fig. 136 illustrates a practical substitute method. Turn a right hand tap, which has the number of threads desired, into a nut until a snug fit is obtained. Remove the tap and cut a V slot in the nut, as shown. This slot

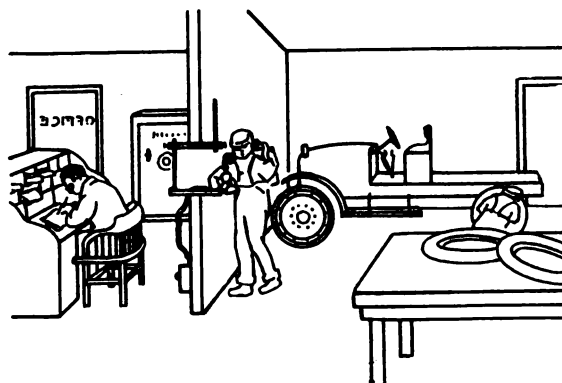


Fig. 135—Combined Office and Shop Telephone.

should be of sufficient depth so that when the tap is replaced one cutting edge will be slightly above the bottom of the groove. The assembly

should then be turned over. The rod to be threaded is placed in contact with the tap and a piece of soft copper placed between the rod and vise

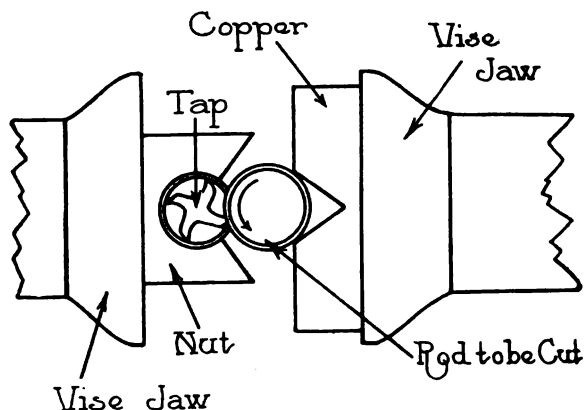


Fig. 136—Cutting Left Hand Threads.

jaw. This is imperative, as otherwise the hard jaw would injure the threads. By turning the rod to the left the left hand thread is made.

REPAIR OF EXPANDING BRAKES.

On several types of cars there is excessive wear at the point where the cam engages the metal surface of the expanding brake. Fig. 137 illustrates a practical method for remedying this trouble. The metal surfaces are first trued and then steel plates cut to conform to the size. Two holes are drilled and countersunk to admit the heads of the retaining screws. The pieces are then securely screwed in place.

QUIET STARTING.

Often times carburetors are set in such a manner that it is necessary to open the throttle fairly wide before the motor can be started. The result is objectionable to pedestrians and it tends to frighten nervous horses. When the cranking is over the engine starts with a roar and the driver usually makes a rush to adjust the throttle lever. This commotion can be eliminated if the following procedure is observed. With the ignition switch in the off position, open the throttle as widely as desired and then turn the engine over a few times with the crank. Retard the throttle lever to about an inch from the bottom and with the switch turned on, the motor will generally start with one sharp pull of the crank. It will run quietly and without racing. The same suggestion can be advantageously adapted to cars that are started on the spark. It will be unneces-

sary to crank the second time, as the cylinders will be filled with compressed gas, which only requires the press of the button to ignite it.

RESTORING BRAKE EFFICIENCY.

Not infrequently after much use the brake drum of a wheel will become so highly polished as to reduce the efficiency of the brake. This condition may be easily remedied by cutting grooves about 1/16-inch in depth across the drum. These grooves can best be cut with a three-cornered file and when carefully made they will not damage the brake lining. About three grooves on each drum will be sufficient.

IMPROVED ACETYLENE LAMPS.

Through the space provided to carry off the heat of gas lamps, more or less dust and dirt will find its way, and after long service the black paint will become shiny, especially if it is cleaned frequently with a stiff cloth. This paint is utilized to absorb certain rays of light and it may be renewed easily by using a dead black.

PAINTING THE CAR BODY.

Only the expert can make a workman like job of painting an automobile body. Nevertheless, a very satisfactory appearance can be obtained by washing the body's surface carefully with warm water in which a little ammonia has been mixed, and then giving the body a coat of thin varnish.

If the source of trouble in an overheating motor cannot be located, it will be well to inspect the blades of the fan to determine that they have

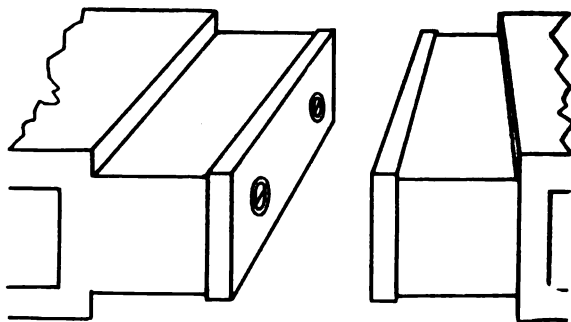


Fig. 137—Repair of Expanding Brakes.

not become flattened or otherwise bent out of shape. At the same time ascertain that the fan belt is tight and does not slip.

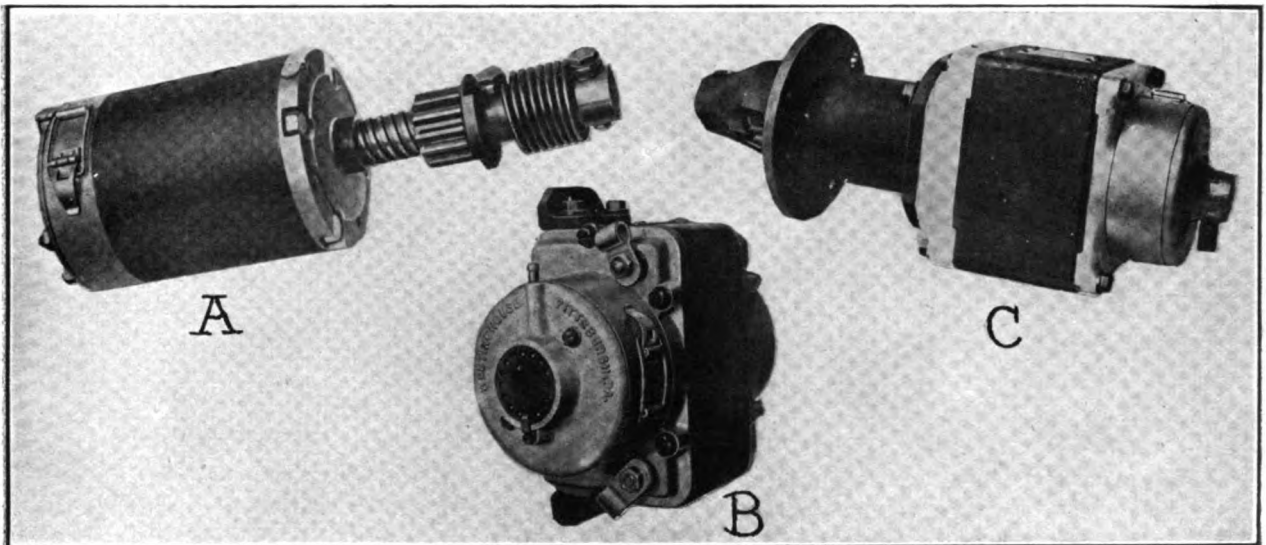
MOTOR STARTING AND CAR LIGHTING.

Some of the Characteristics of Design of the Motors Specially Developed for the Westinghouse Systems and the General Method of Construction.

FEW motorists understand or realize the work that is ordinarily required of a starting motor. Because they are informed that an electric motor will start an engine they believe that they are justified in using it as they please, and that the motor will endure all manner of abuse, when as a matter of fact they ought to be exceedingly careful and not unnecessarily burden it.

The starting motor is in service but a very brief part of the time that the car is driven, and the cranking of the engine requires but a very few seconds. But there are innumerable possibilities for overloading a machine and doing dam-

the moving and contacting parts, the piston rings and the pistons against the cylinder walls, the connecting rods, the crankshaft bearings, the timing gears, the camshafts, the valve tappets, the valves (one or more against spring tension), the water pump, the magneto, the generator, the lubricating pump, the fan, as well as the weight of these parts and the flywheel (the inertia) to be moved; there is the resistance of the lubricant between all moving and contacting surfaces, and in addition there is the necessity of compressing the gas or atmosphere in at least one cylinder to a pressure from 40 to 80 pounds.



Typical Westinghouse Motors: A, No. 700 Motor Frame with Inboard Automatic Screw Shift; B, Frame of No. 502 Motor; C, No. 318 Motor Frame with Outboard Automatic Screw Shift.

age that may be serious. Motorists who have cranked an engine by hand ought to know that the conditions that cause starting to be difficult when done manually obtain in the same ratio when the engine is started mechanically.

For a better understanding of this subject a review of the conditions that may obtain is desirable. The assumption is that an engine is perfectly balanced and that comparatively little effort is necessary to turn it, which is correct enough in theory provided there is no resistance to turning. But first of all there is the friction of

The power required to turn the engine depends also upon the dimensions of the parts and the leverage that is obtained with the starting crank. Normally the most efficient application of manual power is a quick effort, but this is necessary from the fact that only a very strong man could do this slowly, and that an engine must have as much momentum as is possible to give it, especially with magneto ignition, for the electric spark can only be created by the action of the machine.

With a battery as a current source the

strength of the electric spark that causes ignition is not dependent upon the speed of the engine, as it is caused by the interruption of the current, and as a matter of fact the slower the revolution the greater is the period of spark duration and the more certainty of combustion. The engine that cannot be fired, save with great manual effort when equipped with a magneto because of speed necessary to produce a sufficient ignition spark, can be fired much easier with a battery as a source of current unless the voltage of the battery is much reduced. The statements apply to normal operating conditions.

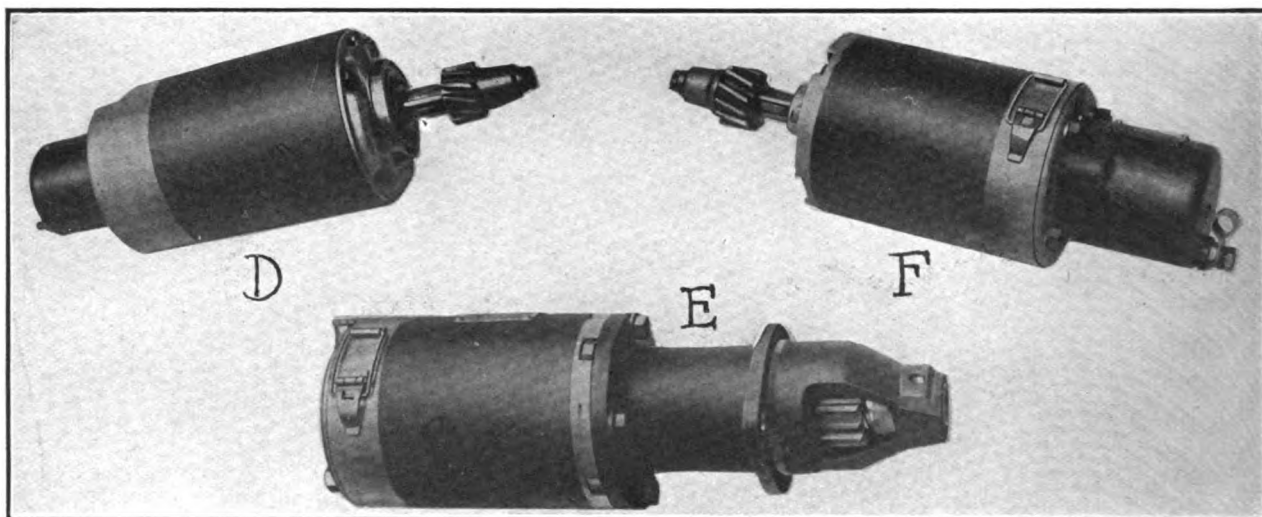
Limit to Length of Cranking Handle.

Manually the power is applied by a crank coupled to the crankshaft of the engine of such length as the inertia of the engine and its com-

is necessary to continue turning it, but the effort required is so great that no man of average physique can "spin" an engine for more than a comparatively few times without a rest.

Work Required of a Motor.

The reader may wonder why this statement is made with relation to electric starters, but the purpose is to impress upon him what a motor must do when used for turning an engine, and how different the conditions are when the motor is coupled to the crankshaft or flywheel. The motor that drives the engine through the crankshaft has a coupling of gears or chains, and in either case there is a very large reduction, which is in reality the leverage. When the motor shaft carries a pinion that meshes with an external ring gear either cut into or shrunk on to the flywheel,



Westinghouse Round Motors: D, Frame of No. 775 Motor with Magnetic Pinion Shift; E, Frame of No. 750 Motor with Outboard Automatic Screw Shift; F, Frame of No. 700 Motor with Magnetic Pinion Shift.

pression demands in the opinion of the builder. The greater the leverage the easier the engine can be turned, but there is a limit to the length of a crank, largely from the fact that manual power cannot be exerted if the swing is too long, for this requires excessive body motion and at the lower part of the turn the effect of the effort is very much reduced. The driver of average height who stands in front of a car to crank it will be able to exert his strength more effectively with a handle of standard length than with one from four to six inches longer.

In turning an engine manually the greater part of the power application is upward, which may be likened to lifting, and there is dependence in the swing carrying the crankshaft around until the succeeding lift. There is no doubt that more power is required to start an engine turning than

the reduction is correspondingly large.

Physically a man has strength that is estimated to be equivalent to an eighth horsepower, but he can develop power much in excess of this for a short interval—the strength decreasing as the period of exertion increases. From five to 10 seconds may be taken as the time necessary for cranking an engine to a speed where firing will be begun.

The work required of a starting motor differs greatly with that done by hand cranking. Instead of starting quickly, the motor begins to turn slowly and accelerates to what may be considered to be a maximum; instead of stopping because of failing strength, the motor is expected to increase its speed and maintain it at a point where it will be efficient so long as this may be necessary.

The motor that will effectively turn an engine

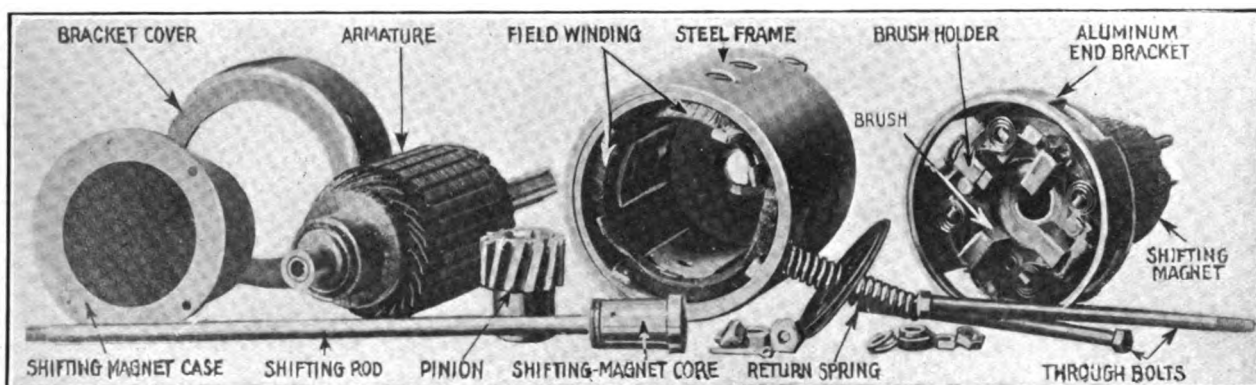
so long as there is need will, with the necessary reduction, require from half to one horsepower, according to the size, and this does not comprehend the power that can be obtained by increasing the load. The motor will not deliver its normal power until it is turning at what may be considered to be its rated number of revolutions, and yet it must have capacity to turn the engine from a full stop against every resistance while it is accelerating.

The electric motor generates power through speed, and it can be driven with great rapidity for a short time. Where a motor is used for starting purposes only it is generally series wound, which, the reader will remember, is a construction in which all of the current drawn from the battery for conversion into power passes through the wiring of the field coils to one of the brushes. The greater the work to be done the greater will be the flow of current, and the more the current

shock, speaking in the same sense that the expansion of steam is gradual, and there is no hammer blow such as is resultant from the explosion of gas in a cylinder of the engine. The leverage is exerted through the reduction gearing and the motor turns the engine with what is seemingly no effort. The power is evident, however. But the word gradual does not mean slowly. After the engine has been started it will turn with less resistance, and less power will be required for 100 revolutions than for 25.

Periods of Work Generally Brief.

When the engine has reached 100 revolutions a minute it ought to begin firing, and this speed ought to be reached in less than 10 seconds. In fact, if the engine is not firing within 10 seconds there is a condition existing that causes failure of operation, either in carburetor or ignition, and no good purpose will be served by continuing to turn it. Probably no greater mistake is made by



The Standard Components of the Round Type Motor Equipped with Magnetic Pinion Shaft.

drawn the stronger will become the field magnets and the power of the motor will be proportionately increased.

Power Proportionate to the Work.

By this is meant that the harder the work is for the motor the greater power it will develop. Now the voltage of a battery used with a starting motor will be practically unchanged by any ordinary demand made upon it, but there can be a considerable drain upon its amperage. Closing the starting switch may send a current of six or 12 volts at a rate that may be as high as 400 amperes, and possibly more. The motor will increase its speed to possibly 3000 revolutions a minute, the current drain being proportionate to the work and the load, that is, greatest at the instant of starting and diminishing as speed is obtained.

In starting, however, the load upon the motor is greatest in overcoming the inertia of the engine, and this is done gradually and without

car drivers than continuing to crank an engine after there is evidence that there is a fault that must be corrected, and continuance is a drain upon the battery and possibly an overload of the motor.

Because of the comparatively brief work that is required of them, starting motors are made small—in reality smaller than they ought to be to withstand the abuse that they are frequently subjected to—and yet they are more than adequate in proportions if they are used as they should be used. There is no construction that is better designed than an electric motor to do the work for which it is intended, and very few machines have so large margins of safety with reference to endurance under very great overloads, so that, if used with reason, there is practically no wear. That is to say, that a well built motor ought to serve every requirement perfectly far longer than the car in which it is installed.

The motor, however, cannot be overloaded for an appreciable period without heating, which may be destructive of the insulation or of the commutator, or both. This is not a condition peculiar to the machines used for engine starting, but it obtains with all motors, of all sizes and descriptions. A battery can be discharged very quickly if the circuit is closed, for the voltage pressure is forcing the entire amperage through the line, and there is comparatively little resistance to it. This amperage is only limited by the period of flow, and to continue such a flow of current beyond a necessary time is certain to cause damage. This may be in the form of ruptured insulation of the power wiring, or it may be burning from excessive heating of the motor itself.

The Westinghouse Systems.

The Westinghouse Electric and Manufacturing Company, East Pittsburg, Penn., one of the largest makers of electrical apparatus in the country, produces single and two-unit systems of starting and lighting for automobile vehicles, and with which ignition circuits may be combined; lighting and ignition systems, ignition systems and starting and lighting equipment for Ford cars. These are all specially designed systems, that have been carefully developed and which have been improved wherever experience has demonstrated that perfecting was possible.

The motors are built in two forms with reference to frames, and generally are designed to be coupled to the flywheels by pinions that mesh with external ring gears. These couplings of the motors resemble in general principles those of numerous other systems, the means being efficient and suited for a very large proportion of the engines built without any material change in design. The motors are in different sizes and types, rated at $\frac{1}{2}$, $\frac{5}{8}$ and $\frac{3}{4}$ horsepower at normal speeds of 725, 900, 1100 and 1500 revolutions a minute with rectangular frames, and with $\frac{5}{8}$ and $\frac{3}{4}$ horsepower at 1050, 1100 and 1200 revolutions with round frames.

Some Characteristics of Design.

These motors are series wound constructions which are operated by a six-volt current supplied from the storage battery. The design is such that for every horsepower developed approximately 150 amperes of current are drawn from the battery, and the flow of current at starting will frequently much exceed this value. Characteristic curves of the Westinghouse starting motors for flywheel drive show that initial amperage demands will range from 375 to 250 amperes, which will diminish as the speeds increase. For instance, one diminishes from 375 amperes at 475

revolutions to 35 amperes at 3500 revolutions, a second from 300 amperes at 400 revolutions to 50 amperes at 1900 revolutions, a third from 255 amperes at 850 revolutions to 90 amperes at 4500 revolutions, a fourth from 250 amperes at 600 revolutions to 50 amperes at 5000 revolutions, and a fifth from 250 amperes at 200 revolutions to 30 amperes at 1800 revolutions. These are stated as illustrations of possibilities with reference to these machines.

Westinghouse motors are designed to have high starting torque with minimum consumption of current, and among the purposes obtained through design is the smallest practical drain upon the battery, this in turn making the battery and the generator correspondingly smaller, which results in a saving of the weight of the equipment throughout. There is ample power obtainable for all requirements, and a considerable excess of what would be ordinarily necessary for the work.

Four-Pole Series Wound Types.

The motors are the four-pole, series wound type, the field winding being placed on two of the poles. These are constructed with two types of housing or frame, the one round and the other rectangular, so that there is a choice of the shape that will be best adapted for the engine with which a motor may be used, for rigid mounting is essential to satisfactory operation and endurance. With these housings the motors are completely enclosed and are fully protected against dust, water or oils. The frames are cast steel or wrought iron, according to the type, both of these metals having high degrees of magnetic permeability, and there is ample strength with comparatively light weight.

The end frames are machined aluminum castings, these having lightness and strength, which are secured to the frames by heavy set screws and lock washers. The armature shafts have large diameters and are finished with either squared or tapered ends as desired. The armatures are slot-drum types with cores of laminations of soft iron. These laminae are insulated and are assembled under heavy pressure and are secured by locked end plates. The winding coils are laid in the slots and are insulated with heavy cotton fabric that is impregnated with a special insulating compound. The windings are retained by substantial bands.

The insulation of the armature will not soften at a continuous temperature of 250 degrees Fahrenheit, and will endure heat considerably in excess of this for short periods. The field coil is also treated with the same insulating composi-

tion. Whenever possible aluminum wire is used to minimize weight. The commutators are of heavy copper segments securely retained in substantial insulation and are adequate in size for endurance. The brushes are metal and are so mounted that they can be removed and replaced without the use of tools. The current is carried to the brush by a low-resistance copper shunt and not by the brush spring. Silver-tipped connections are made by the brush holders when the brushes are inserted.

The armatures are mounted on either plain sleeve or annular ball bearings as may be desired, but owing to the comparatively limited use of the starting motor the sleeve bearings are regarded as sufficient for all purposes unless the buyer specifies otherwise.

(To Be Continued.)

N. A. C. C. SAFETY FIRST COMMITTEE.

A Safety First committee was appointed at the December meeting of the National Automobile Chamber of Commerce, with J. Walter Drake, president of the Hupp Motor Car Company, as chairman. The committee will encourage the movement to safeguard workers in automobile factories by the application of protective devices to dangerous machinery and will co-operate with safety first organizations seeking to reduce the number of highway accidents.

Education of the public in ways to avoid accidents will be taken up through talks in the public schools and by special articles. Reports of the New York police department show that 90 per cent. of the street accidents are due to carelessness of pedestrians and children playing in the streets. The chamber will lend moral support to severe prosecution of speeders, as well as those who needlessly use cut outs and blow horns.

A campaign of education will be conducted by the 96 member companies among their purchasers. They will co-operate also with state and city authorities who have to deal with violations of automobile laws.

KING SAFETY FIRST RESOLUTIONS.

Furthering the campaign of the motor manufacturers to reduce friction and hostile opinion against motor cars by encouraging care and consideration in the way they are used, the King Motor Car Company has sent its dealers a set of New Year's resolutions for their own use and to be suggested to King owners.

One of the resolutions is not to throw dust in the other fellow's face. This can be avoided in passing another car by going fast enough to get well ahead while staying inside the speed limit. Other suggestions are, not to draw away from the curb without giving the proper signal to those approaching in the rear; not to cut in front of a car going in the same direction any nearer than 100 feet to it; to carry skid chains at all times and use them as soon as it rains to protect the lives of others; not to neglect any of the rules which go to make up the courtesy of the road.

CROSSES IOWA QUICKLY.

William H. Crossman, Ogden, Ia., in a Hupmobile recently broke the record for crossing the State of Iowa. He made the distance of 289 miles in 10 hours and four minutes, or at an average of 39.48 miles per hour. The previous record was 38.82 miles per hour. All gears, except high, were taken out of the car before the start was made.

COMING EVENTS.

January.

Jan. 10-15—Show, Buffalo, N. Y.
Jan. 10-15—Show, New Bedford, Mass.
Jan. 10-15—Show, Fort Wayne, Ind.
Jan. 10-Feb. 1—Show, Jacksonville, Fla.
Jan. 14-22—Show, Dayton, O.
Jan. 15-22—Show, Detroit.
Jan. 17—Show, Wilmington, Del.
Jan. 17-22—Show, Rochester, N. Y.
Jan. 18-22—Show, Baltimore.
Jan. 22-29—Show, Chicago.
Jan. 22-29—Show, Montreal, Que.
Jan. 23-30—Show, Portland, Ore.
Jan. 24-29—Show, Buffalo.
Jan. 25-29—Show, Lancaster, Penn.
Jan. 29-Feb. 5—Show, Columbus, O.
Jan. 29-Feb. 5—Show, Minneapolis.
Jan. 31-Feb. 5—Show, Fall River, Mass.

February.

Feb. 7-12—Show, Worcester, Mass.
Feb. 7-12—Show, Kansas City, Mo.
Feb. 8-11—Show, Sioux Falls, S. D.
Feb. 9-12—Show, Peoria, Ill.
Feb. 12-19—Show, Hartford, Conn.
Feb. 14-19—Show, Des Moines, Ia.
Feb. 14-19—Show, Cedar Rapids, Ia.
Feb. 19—Show, Newark, N. J.
Feb. 20-27—Show, Grand Rapids, Mich.
Feb. 21-26—Show, Bridgeport, Conn.
Feb. 21-26—Show, Louisville, Ky.
Feb. 21-26—Show, Omaha, Neb.
Feb. 21-26—Show, Portland, Me.
Feb. 21-26—Show, South Bethlehem, Penn.
Feb. 21-26—Show, Syracuse, N. Y.
Feb. 28-March 4—Show, Paterson, N. J.
Feb. 28-March 4—Show, Watertown, N. Y.
Feb. 29-March 4—Show, Sioux Falls, Ia.
Feb. 29-March 4—Show, Fort Dodge, Ia.

March.

March 4-11—Show, Boston.
March 6-11—Show, Utica, N. Y.
March 8-15—Show, Brooklyn, N. Y.
March 21-25—Show, Deadwood, S. D.
March 28-April 3—Show, Manchester, N. H.

INDUSTRIAL HAPPENINGS AND COMMENT.

THE Eisemann Magneto Company, Brooklyn, N. Y., announces that deliveries have begun on a contract made some months ago with the White Company, Cleveland, for the Eisemann type G4 magneto. This magneto will be standard equipment exclusively on White trucks for 1916.

The Thomas B. Jeffery Company, Kenosha, Wis., is employing on its present day and night shifts approximately 3000 men, as compared with 1300 a year ago. During the first six days of December last the company shipped more cars than it did during the entire month of December, 1914. The big business at this time is the result of a large domestic and foreign demand.

The Fisk Rubber Company, Chicopee Falls, Mass., reports that the exterior construction work of the several new buildings now being added is nearly complete.

The Goodyear Tire and Rubber Company, Akron, announces that all its male employees who have attained the age of 70 years and its female employees who have reached 65 may retire and receive stated monthly payments for life. Under certain conditions the employees may retire at lower age limits and receive similar benefits. All employees are eligible to receive \$1000 insurance policy from the company on joining the Goodyear Relief Association, which provides sick and disability insurance. The company has had in operation for a long time a plan by which its workers might buy their own homes.

The Bosch Magneto Company held its annual distributors' convention on Dec. 30 in the offices of the advertising department, 1764 Broadway, New York City. The session lasted all day and was ended by a banquet

at one of the city's popular restaurants. The next day the delegates were taken in a special parlor car to inspect the company's works at Springfield, Mass. There were 36 delegates, including the officers of the company, present. The representatives of the Bosch headquarters were: Otto Heins, president; A. H. D. Altree, vice president; G. Jahn, treasurer; A. H. Bartsch, advertising manager; V. W. Kliesrath, chief engineer; W. L. Fetherston, assistant sales manager.

The Inter-State Motor Company, Muncie, Ind., has been compelled by a large increase in its business to make extensive additions to its plant. The



Thirty-Six Delegates Attended Bosch Magneto Company's Distributors' Convention

The Fisk plant now includes 20 large buildings and has approximately 29 acres of floor space.

The Puritan Machine Company, Detroit, announces that it has experienced the largest business in its history, the receipts in the service, accessory and general mail order departments being uniformly 75 per cent. greater than any previous fiscal year. During 1915 the company purchased seven companies that have ceased manufacturing—Ohio, Crescent, Mondex, Havers, Owen, Cartecar and Scripps-Booth Cycle Car. These acquisitions bring the total of such companies up to 71.

The New Era Engineering Company, Joliet, Ill., announced just before Christmas that it had deposited in a local bank the sum of \$5 for each employee who had been with the company not less than three months, and \$2.50 for those under three months. The company also announced that in addition to the bank's three per cent. interest on any deposits made during the present year, it would pay interest at the rate of two per cent., making a total of five per cent. on deposits. This plan is expected to increase the loyalty of employees.

latest is a factory unit 80 by 150 feet and giving 36,000 square feet of floor space for manufacturing purposes. A production of 6000 cars is being planned for the coming year.

The Mitchell-Lewis Motor Company, Racine, Wis., recently sent a 201-pound package by parcel post to Petrograd, Russia. This is believed to be the largest package of motor parts ever shipped in that way, the method being made necessary through refusal of express companies to accept large parcels for foreign shipment. The postage amounted to \$96.84.

The Burd High Compression Company, Rockford, Ill., has completed its new factory. The building, measuring 129 by 190 feet, is of monitor type and provides 19,000 square feet of manufacturing space. Men employed number 250, and 25,000 rings will be produced daily.

The Saxon Motor Car Company, Detroit, has made factory extensions that will double the output of the plant, making a possible maximum production of 250 cars a day.

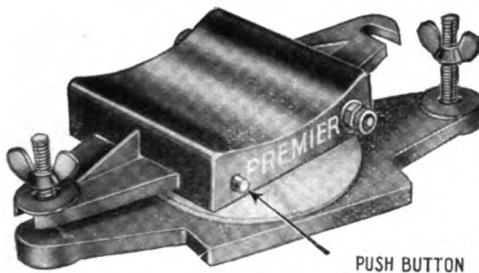
CAR ACCESSORIES AND EQUIPMENT.

AUTOMATIC VULCANIZER.

The Premier automatic electric vulcanizer, manufactured by the Premier Electric Company, 4041 Ravenswood avenue, Chicago, is designed to operate from a storage battery or from a 110-volt lighting circuit. Besides eliminating the danger of fire, the automatic thermostatic cut out greatly simplifies the operation of vulcanizing. With this patented automatic temperature control, it is impossible to overcure or burn the tire, as the electric current is automatically and instantly shut off when the vulcanizer has attained the proper degree of heat.

Operation of the Premier is extremely simple. After preparing the tube or casing, the device is clamped on and the button pressed. The operator is then free to do other work, as when the repair is completed the electric current is automatically cut off.

The apparatus weighs but two



PUSH BUTTON

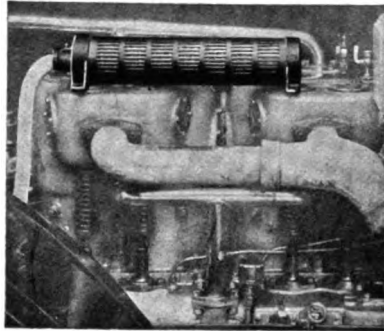
pounds and may be conveniently carried in the tool compartment of the car. Standard equipment includes a tire tool for holding open the cut when preparing, scissors for cutting the Para rubber gum, a tube of quick curing cement, a piece of emery cloth for cleaning and roughening the rubber, and wax papers to place over the repair to prevent the vulcanizer from sticking. The vulcanizer is fitted with a connecting cord and a durable chain for clamping to the work.

The Premier automatic electric vulcanizer is also furnished with approved type connecting cords and connectors and a separate base for holding the instrument when not in use. This model has been approved by the National Board of Underwriters. List price, \$3.50; with base, \$5.

ELECTRIC HEATERS.

A complete line of practical electrical heaters for use in automobiles,

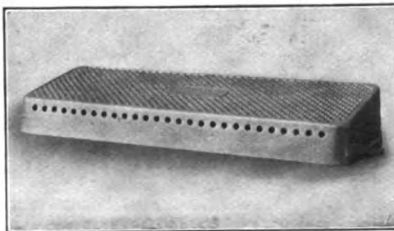
either electric or gasoline, is manufactured by the Consolidated Car Heating Company, Albany, N. Y. The heater shown in the upper illustration



is designed to keep the engine and carburetor warm when the car is left outside or in an unheated garage during very cold weather. It is placed under the hood and attached to any convenient part of the engine desired.

A flexible cord and plug is provided for attaching to any standard lighting circuit, and the heater can be made to operate on any standard lighting voltage. It will maintain an even temperature as long as the current is switched on and operates at a very small expense.

The lower cut illustrates a portable heater adapted for use on the floor of a car to keep the feet of the passengers warm. When installed in a closed car it will maintain normal temperature. This heater mounts close to the floor and has an inclined top similar to a foot rest. A small amount of current is consumed and an even, steady heat is given off. An important feature is that a thermostat, mounted inside, automatically cuts off the current should the temperature reach a predetermined point. This ar-

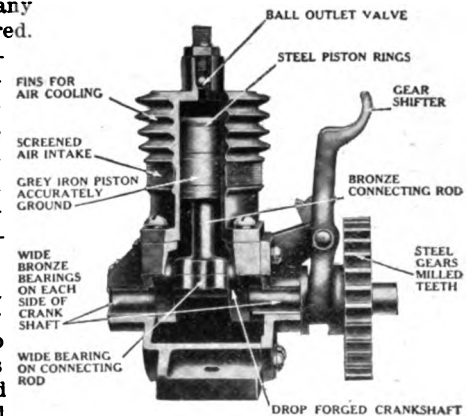


rangement eliminates accidental burning of robes and clothing. It is provided with a flexible cord for attaching to the battery circuit. Further in-

formation, prices, etc., will be supplied to those who mention this publication when writing to the manufacturer.

MANZEL AIR PUMP.

The new single-cylinder tire pump illustrated herewith is a new addition to the line of air pumps manufactured by the Manzel Brothers Company, Babcock street, Buffalo, N. Y. Pursuant to former practise, this model is of all metal construction. The cylinder, crank case and piston are made of fine gray iron, the connecting rod and crankshaft bearings are of bronze. The crankshaft is a drop forging. The cylinder has a bore of $1\frac{3}{4}$ inches and the piston a stroke of $1\frac{1}{2}$ inches.



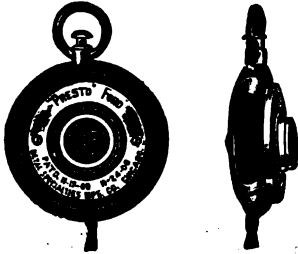
As on the two-cylinder model, the same principle of air intake and outlet is adhered to. Air is taken into the cylinder when the piston is at its lowest point, through holes in the side wall. These holes allow just sufficient air to enter the cylinder and are automatically closed by the piston on its upward stroke. This design affords the greatest possible efficiency, as all air must go out through the outlet valve.

The pump is supplied with complete fittings for immediate installation to the various cars. These fittings are designed so that the pump can be installed without doing machine work, removing the radiator or otherwise altering the car.

The pump lists at \$12 with fittings for all cars except the Buick, Overland, Dodge and Chevrolet. The model designed for these cars is sold for \$10.

CIGAR LIGHTER.

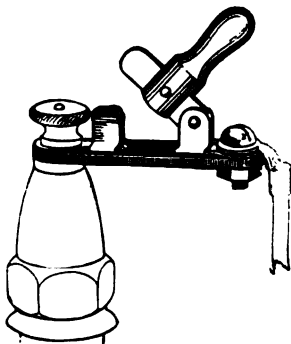
The Metal Specialties Manufacturing Company, Inc., 730-738 West Mon-



roe street, Chicago, is the manufacturer of the Presto No. 204 watch type cigar lighter for Ford cars. Power is supplied direct from the Ford magneto. The lighter is equipped with 10 feet of silk cord, which can be easily attached by leading the wires between the dash and the foot board. One terminal is connected to the binding post on top of the magneto and the other one to any screw holding the cover of the gear case. The feature of this device is that the operator or passengers are allowed to light their cigars without stopping the car, eliminates the use of matches and all danger of fire, and is absolutely safe, all metal parts being thoroughly insulated. The price of the lighter, complete with holder and "Ford Special" pure platinum tip, 10 feet of silk cord and plain terminals, is \$2.50. This company manufactures a complete line of cigar lighters and full details will be supplied on request when this publication is mentioned.

SPARK PLUG SWITCH.

The C. B. spark plug switch, shown in the accompanying illustration, and manufactured by William J. Bailey, 401-407 Mulberry street, Newark, N. J., is an ignition trouble finder. It is designed to attach permanently to the

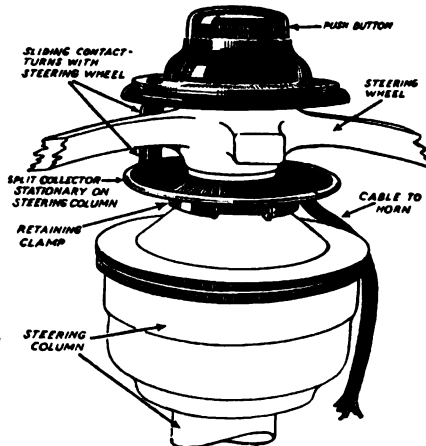


spark plug. Its function is to instantly determine the missing cylinder without the use of tools, or taking the plugs from the cylinders. The switch

will communicate the condition of the magneto or battery, as well as that of the spark plug and the strength of the spark. Its use eliminates the danger of shocks, and one person can test any number of cylinders. Attachment is simple and can be effected in a few minutes. It is made of the best material, strongly constructed and guaranteed for the life of the car. Price will be supplied by the manufacturer when requested.

SIGNAL CONTROL.

A push button located in the centre of the steering wheel is recognized as the most convenient type of signal control. Cars which have this arrangement as standard equipment always have the device built in the steering column, because of the fact that the steering wheel is practically in con-



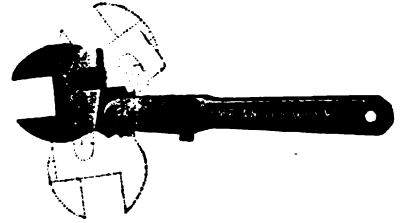
stant motion. To do this on a car not already provided with a centre button is manifestly impossible. A common makeshift method is to attach an ordinary push button to one of the spokes, leaving the cable long enough to move with the steering wheel.

The American Coil Company, Foxboro, Mass., has designed a push button which can be readily mounted on the centre of the Ford steering wheel. The electrical connection is made by a spring contact, which makes a sliding connection with a ring rigidly clamped on the steering column. The operation will be readily understood by reference to the accompanying illustration. The size of the push button is such that it may be readily operated with the palm of even a gloved hand.

This push button, in combination with the Ford magnet horn, makes an ideal installation for Ford cars, it requiring no battery. The combination sells at \$4. The button can be purchased separately for \$1.50.

ANGLE WRENCH.

The Imperial Tool Company, Bloomington, Ill., has recently placed on the



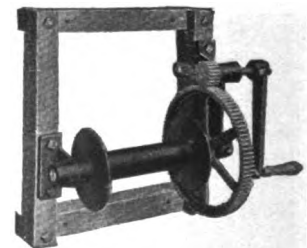
market the adjustable handle angle wrench shown in the accompanying illustration. This tool incorporates a number of advantageous features. It is equipped with an adjustable jaw that will take any tap up to 1 1/4 inches at eight different angles, or the tap can be turned at close quarters by ratcheting the handle one or more notches at a time in either direction. This is accomplished by simply pressing a ratchet button. When the button is released the handle is rigidly locked.

This wrench takes the place of many sizes, styles and types of tools. It is easily operated in positions and angles where other tools could not be used. It is not a novelty, but a tool made of the best material and is guaranteed for hard usage.

Because of its great adaptability, this wrench should prove a valuable addition to auto kits, repair shops, garages and machine shops. Further information will be supplied by the maker on request.

PORTABLE HAND HOIST.

The Erie Hoist Company, 1901 Holland street, Erie, Penn., is the manufacturer of the hand power hoist shown in the accompanying illustration. It can easily be changed from any place to another, as it fastens to the wall or ceiling by bolts or lag screws. The hoisting action is controlled by a hand crank at the side

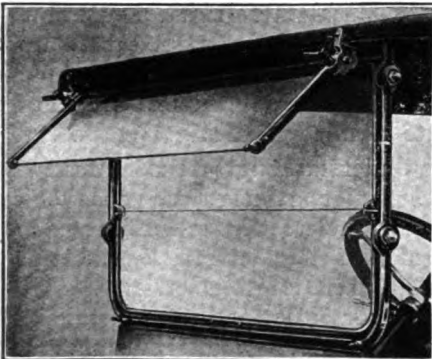


and the load is held by a ratchet dog on the frame, which fits in the drum gear teeth. When it is desired to quickly unwind the rope the hand

lever shaft can be pushed toward the drum, thereby bringing the gears out of mesh and releasing the drum. This hoist is listed as No. 20 and has a lifting capacity of 900 pounds. The weight of the apparatus is 95 pounds. It retails at \$28. Details concerning other hoisting equipment manufactured by this company will be sent on request when this journal is mentioned.

WINDSHIELD VISOR.

The Banker windshield visor, illustrated herewith and manufactured by the Banker Windshield Company, Ellsworth and Negley avenues, Pittsburg, Penn., is designed to attach to the bow of the top, or to the roof of the limousine. When adjusted, it prevents rain, snow, mist, etc., from reaching the upper glass of the windshield and thus affords the driver a clear vision re-



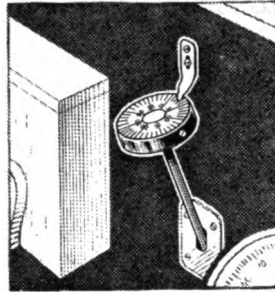
gardless of weather conditions. Friction joints allow the visor to be easily adjusted to any position desired. When lowering the top of the touring car or roadster, the visor can be folded inside the top and the two folded back as a unit.

The visor consists of a handsomely finished black enamelled steel frame with friction joints operated with wing nuts. A quarter inch selected Pittsburg plate glass is packed in the best grade of channel rubber and set in a deep channel frame. All parts are made extra strong to withstand hard service. Each visor is shipped complete with all fittings for attaching. The prices range according to size and the maker will supply detailed information on request when this publication is mentioned.

When ordering the Banker windshield visor, the type of car and the size of the visor desired should be specified.

S & B CARBURETOR ADJUSTER.

The Schoener Manufacturing Company, St. Cloud, Minn., is the manu-

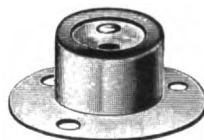


facturer of the S & B carburetor adjuster for Ford cars, shown in the accompanying illustration. It consists of a cap, with figures and scale, that is designed to fit the carburetor rod cap. The marks on the cap register with an indicator point attached to the dash of the car and allows the operator to set the carburetor to suit any climatic change and also eliminates guess work when turning the cap back to obtain the best operating conditions.

An important feature is that the carburetor rod cap can be given one turn to the right when the operator is leaving the car in public places. This would not be known by anyone except the operator and it would be impossible for unauthorized persons to start the car. When the operator wishes to start the engine, he simply turns the cap to the left to the previous starting point. Statement is made that the saving of gasoline alone will greatly offset the cost of the device. The apparatus is made of the best grade steel, heavily nickel plated and guaranteed not to rust. The retail price is 50 cents.

POCKET LEVEL.

The pocket level illustrated herewith is termed the No. 2 Tampa which way level. It is manufactured by the E. G. Smith Company, 315 West Park avenue, Tampa, Fla., and consists of a

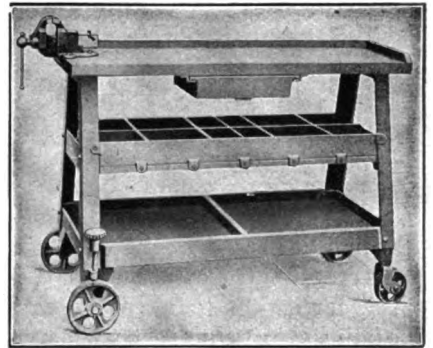


circular vial fastened in a steel casing one inch in diameter and $\frac{3}{8}$ -inch in height. There are three $\frac{1}{8}$ -inch holes in the base of the casing for the fast-

ening of the instrument to a larger surface. The level may also be had with a polished brass base of $1\frac{1}{2}$ or $2\frac{1}{2}$ inches diameter. These bases are graduated into 50 and 100 divisions respectively. This arrangement greatly assists in pointing out in which direction the work is out of level. They are heavily nicked and polished and range in price according to size, from 50 cents to \$1.

MANLEY PORTABLE BENCH.

It needs but a glance at the "quick action" portable bench shown in the accompanying illustration to comprehend the convenience which it will afford. Frequently, when minor repairs are necessary on a car, it is often found advisable not to run the car into the garage, but to do the work outside. Nothing can be more con-



venient for this purpose than the bench shown. It has a working surface at the top, where tools may be carried. A vise can also be attached to the end of the bench. The drawer is made of metal and is for wrenches, files and other small equipment. In the 12 compartments on the middle shelf are spaces for various small supplies such as washers, nuts, cotter pins, etc. Tools and supplies may be carried on the lower shelf. It is obvious that this arrangement is really a "floating repair shop," as everything needed is at hand. The top, which is made of hard wood, is 12 inches in width and 44 inches in length. The bench is 31 inches in height and 22 inches in width at the bottom. The weight is 125 pounds. When it is desired to use the vise for filing, the wheels may be locked by hand nuts, as shown. Full information can be obtained by addressing the maker, the United Engine and Manufacturing Company, Hanover, Penn.

PRACTICAL FACTS FOR NEW CAR OWNERS.

Elementary Instructions in the Economical Operation, Maintenance, Adjustment and Repair of the Ignition System—Answers to Inquiries.

FROM the subject of carburetion and carburetors the discussion now progresses to the subject of ignition systems, the principles of

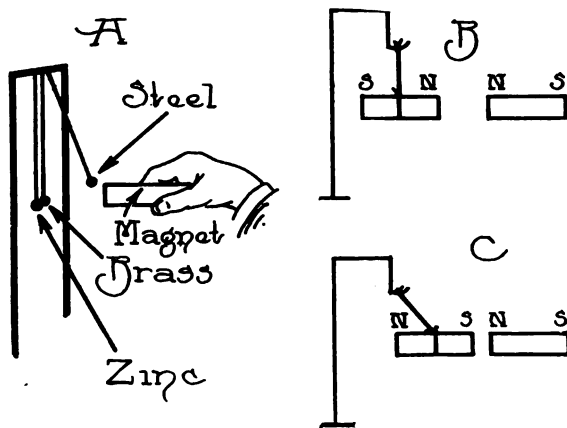


Fig. 1—A, Illustrating Magnetic Influence Over Metals; B and C, How Like Poles Repel and Unlike Poles Attract.

which, it must be conceded, are not generally understood thoroughly. It is to the advantage of the car owner to have a practical understanding of these principles because through that knowledge he will be able to obtain more satisfactory results from operation and can make adjustments more intelligently.

The ignition system, consisting of some form of electric apparatus, is required in gasoline motor vehicles to ignite the explosive mixture in the cylinders of the motor. Other systems have been tried at various times, but none has proved so generally satisfactory as has electricity. In the past ignition has been attempted by the use of a very hot tube that was heated by an external flame from a gasoline lamp, by the use of a very hot wire that was heated by catalytic action, and by the injection of a very hot jet of air or gas that was heated by compression in a small pump.

Electric ignition has been found to be the most dependable system, and is used almost universally. The devices used in this system are usually divided into two groups—low and high-tension, and the primary current is obtained from either storage batteries, dry batteries, a dynamo, or a magneto electric apparatus driven by the engine.

The magneto type of ignition device employs a generator which is designed to deliver current to the combustion chamber, and this system will receive attention first. In passing it might be said that according to the advance specifications of pleasure cars for 1916, approximately 44 per cent. of all the cars are provided with the magneto type of ignition and the balance, 56 per cent., have the battery system. This would indicate that the battery system is regarded with greater favor among the car manufacturers. The relative values of the two has been a widely discussed subject. One explanation for the predominance of battery ignition is that there is a considerable saving in cost of installation over a good magneto system, and that a much neater job is obtained when generator and ignition distributor are combined to eliminate auxiliary shafting.

For a proper understanding of the forces involved in the generation of electrical energy by mechanical means, the reader must first have thorough knowledge of the elementary principles of magnetism and its relation to electricity.

Magnets are bodies, either natural or artificial, that have powers of attraction and repulsion, and of communicating magnetism to iron or steel and a few other metals. The first discovery of a substance possessing magnetic qualities of which we have knowledge was the celebrated lodestone

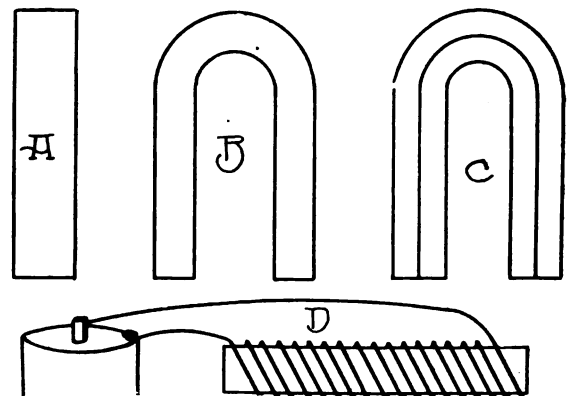


Fig. 2—Illustrating Different Types of Magnets.

found in Asia Minor. It was called by that name, which means leading stone, because it possessed the quality of pointing one particular part of the

stone always toward the north. It was used as a compass by the ancients. A piece of this mineral was suspended by a cord so that it could move freely.

In endeavoring to determine the cause of this peculiarity scientists discovered that the earth itself was a huge magnet, possessing a north and a south pole, or points of magnetic attraction. These poles are now known as the magnetic poles, which influence the compasses used by modern navigators. The lodestone is an excellent illustration of a natural magnet and similar minerals are to be found occasionally in beds of iron ore. The constituent which gives them the magnetic quality is oxide of iron.

That the quality of attraction possessed by a magnet is confined to steel and iron can be demonstrated by holding a horseshoe magnet, the kind children are wont to play with, close to small pieces of those metals. If the same magnet is placed near brass, copper, tin or zinc, it will be found that those metals are not attracted. Another simple test to prove this fact is demonstrated in Fig. 1 A. Suspend three small balls from a standard. Two of these should be made of brass and zinc and the other of iron or steel. Place a bar magnet near the balls and it will be seen that only the ball made of steel or iron will be drawn to it, the other two remaining undisturbed. Experiments similar to these taught the experimenters that the only metals that were subject to magnetism are iron, nickel, cobalt and their alloys. It was also found that magnets possess two opposite kinds of magnetism, or magnetic poles, which have the power to attract and repel each other.

Upon close examination of the magnet in the automobile it will usually be found that one end of the magnet is marked N. This indicates that it is the north pole. The other end, which is not generally marked, is the south pole. The magnetism is always the strongest in the regions known as the poles, or at the ends of the magnet. The north pole is often called the positive pole and is designated by the sign +; the south pole, termed the negative pole, is designated by the mark —.

When the north pole of one magnet is brought near the south pole of another, they exhibit strong attraction for each other, as shown in Fig. 1 C. If the north poles of both magnets are placed near each other, there is no attraction. This is the simple, yet accurate, principle upon which the mariner's compass is based. The needle on the dial is a magnet, the south pole of which is attracted by the magnetic pole of the

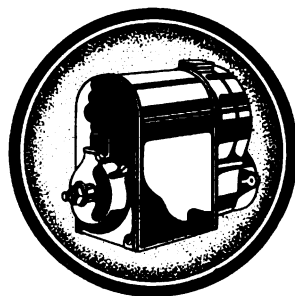
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earth, which is some times called the north pole. Regardless of which way the compass may be turned, the needle will always point to the north.

These tests serve to emphasize the following facts: Every magnet has two poles and like poles repel each other, while unlike poles attract. Magnetism adds no weight to the magnetized article. Even the most sensitive scale will not register a difference in weight between a piece of steel in its natural state and after it has been magnetized.

Magnets are made in two forms and are termed the bar and horseshoe. The core of a vibrating coil is a good example of the bar magnet, while the magnets used in the ordinary magneto are of the horseshoe type. A compound magnet is composed of two or more simple magnets united so that like poles are together. This form of magnet is commonly used because it is found that this type has more magnetic strength than a

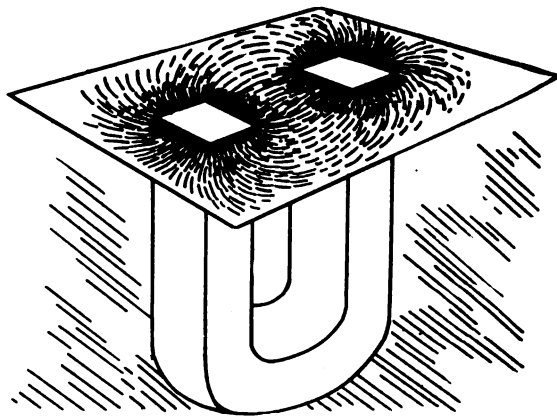


Fig. 3—Magnetic Lines of Force of a Horseshoe Magnet.

simple magnet of the same weight. The different types of magnets are illustrated in Fig. 2.

When a straight bar magnet is placed under a piece of cardboard upon which iron filings are sprinkled, the filings will arrange themselves in curved lines radiating from the poles. If the horseshoe magnet be held under the paper, the filings will arrange themselves as shown in Fig. 3. These lines are termed magnetic lines of force and show that the medium surrounding the magnet is in a state of distress. The space affected is termed the magnetic field. The influence of a magnet is supposed to extend in all directions indefinitely, but the effect is extremely slight beyond a limited area. This area, of course, is governed by the size of the magnet.

As has been explained, when a magnetic field exists between two bodies that possess magnetic qualities there is a certain stress or force existing that has tendency to draw the bodies together

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along the path of the influence. This attraction is by an influence termed ether, which is present in solids, liquids or gasses and pervades the entire universe. It is capable of transmitting heat, light and energy without resistance. It is the medium along which light travels from the stars to the earth. This is the medium by which the electrical waves of the wireless telegraphy are conveyed. The fact that a magnet will attract or repel equally well is sufficient proof that the influence is not transmitted by the atmosphere.

By again referring to Fig. 3 it will be seen that the flow of the magnetism is by curved lines from one pole to the other. The path taken by these magnetic lines of force is called the magnetic circuit. This circuit is continuous, but if it were interrupted by an electrical conductor there would be an electromotive force induced in the conductor.

Magnetic circuits are divided into three kinds

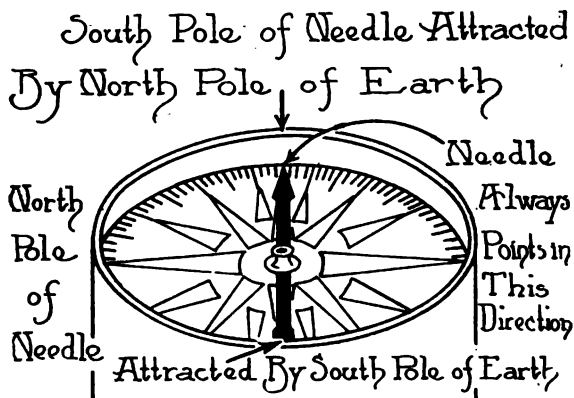


Fig. 4—How Magnetic or "North" Pole of the Earth Influences Needle of a Compass.

—non-magnetic, closed magnetic and compound magnetic. A non-magnetic circuit is one in which the magnetic influence must pass through copper, air or other non-magnetic material, before it can complete its circuit. A closed magnetic circuit is one in which the magnetic influence completes its circuit through some substance possessing magnetic qualities, such as iron, steel, nickel, etc. A compound magnetic circuit is one in which the magnetic influence passes consecutively through magnetic and non-magnetic substances to complete its circuit.

There are two types of magnets. If a piece of steel is brought within the magnetic field of a powerful magnet and allowed to remain there for a considerable period, upon removal it would be found to be a magnet and to possess all the properties of the original magnet. Because of its power to retain this magnetic influence after re-

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removal from the source of magnetism, it is termed a permanent magnet. If a powerful electrical current was made to flow through an insulated conductor wound around a piece of iron or steel, the iron or steel would become a magnet. This is termed magnetism by electro-magnetic induction and the magnet produced is called an electro-magnet. Steel retains the magnetic influence longer than any other metal, and is therefore used whenever a permanent magnet is required. Soft iron is used whenever intermittent magnetic action is desired.

Minerals like iron and steel are very easily influenced by magnetism and are penetrated by it. When one of these metals is present in the magnetic circuit the magnetic influence will leave the ether almost entirely and flow through the metal. Any metal is a good conductor for the electrical current, but all metals are not good conductors for the magnetic influence. Thus it is obvious that when a body of the proper metal is placed in the magnetic field it will become a magnet by induction and have a south pole, where the lines of force enter, and a north pole, where they pass out. It has been previously stated that a conductor carrying a current of electricity will induce magnetism in a bar of iron or steel. By a reversal of this process a magnetized steel or iron bar will induce a current of electricity in the conductor. It is upon this principle that the magneto is constructed.

READERS' QUERIES.

**Construction of Dry Cells, How to
Read Gauge of Prest-O-Lite Tanks,
Protecting Mechanism and Body of
Truck from Salt, Principle of Oper-
ation of Internal Gear Drive.**

Dry Cells—G. H. S., Charleston, S. C.

Can you give me any information concerning the construction of the dry cell?

The dry cell is composed of two elements, usually zinc and carbon and a liquid electrolyte. The common practise is to form the negative electrode by a zinc cup that is closed at the bottom and open at the top. This is lined with several layers of blotting paper or other absorbing material.

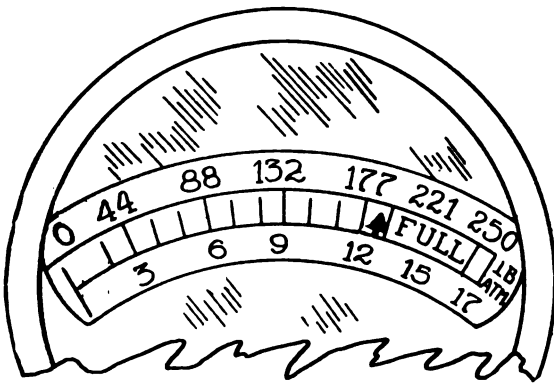
The positive electrode consists of a carbon rod placed in the centre of the cup, the surrounding space being filled with carbon, ground coke

and dioxide of manganese mixed with an absorbent material. This filler material is generally moistened with sal-ammoniac. The top of the cell is then closed with pitch to prevent evaporation and leakage. A binding post is then permanently attached to each electrode for the holding of the wire connections. Each cell is placed in individual paper boxes to prevent the zincs of the cells from contacting with each other when connected to form a battery.

Reading Gauges—F. B., Willimantic, Conn.

My car is equipped with a Prest-O-Lite acetylene tank. I notice that there are two scales on the gauge. I am told that the top scale indicates the number of pounds pressure contained in the tank, but I do not know what the bottom scale stands for. I also notice that when the car is in the garage the gauge shows a greater pressure than when the car is in the open. What is the reason for this?

From the sketch submitted we have reproduced in the accompanying illustration the type



Illustrating How to Read Prest-O-Lite Tank Gauge.

of gauge used on your Prest-O-Lite tank. This gauge registers pressure in both atmospheres and pounds. The manufacturer states that the gas contained in a fresh tank is charged to a pressure of 225 pounds, or approximately 15 atmospheres. The pressure of the gas varies according to temperature. The cylinder is filled at a temperature of 60 degrees Fahrenheit, but during the hot summer months the pressure in a fresh cylinder may swell to 315 pounds, or higher, causing the needle of the gauge to pass out of sight behind the brass cover. In cold weather a fresh tank may only show 135 pounds, or nine atmospheres. This is considerably lower than the word "full," but this is no proof that the customer is not receiving full value. The contents are determined by weight and not by volume. The gauge is attached to the cylinder simply for the user's convenience, to show how much of the light supply remains, but

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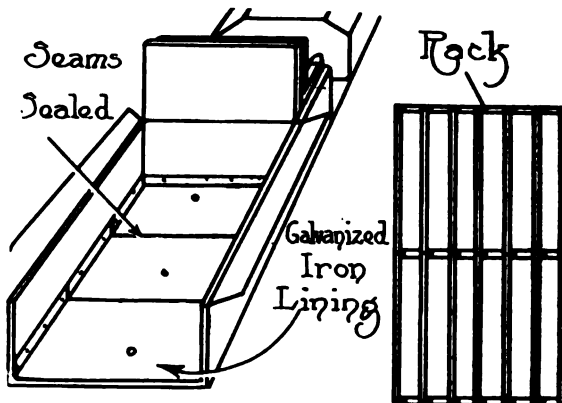
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Lining Body—R. F., Providence, R. I.

I have a truck that is used for the delivery of ice cream. The salt water from the ice cream tubs leaks through the wood floor and besides rotting the floor causes many of the metal parts of the chassis to wear. It is my intention to purchase a new body, but would welcome a suggestion as to how I can prevent the damage to the floor and chassis.

The accompanying illustration shows how the salt water may be drained off without affecting the floor or chassis. Would suggest that after the new body has arrived, you take it to a good tinsmith and have the floor and sides of the body lined with galvanized iron. If separate sheets of iron are used the points of connection should be tightly sealed. Drains should be made in the floor at points where the water can reach the ground without contacting with the car. Have a



How to Protect Truck's Mechanism and Body from Ravages of Salt Water.

rack built to fit the floor. This should be placed on the iron lining to prevent the sharp edges of the tubs from cutting it. When it is desired to clean the floor of the truck the rack can be removed.

Battery Connections—F. A. R., Foster, R. I.

Will you kindly explain what is meant by connecting dry cells in series, parallel and in series multiple?

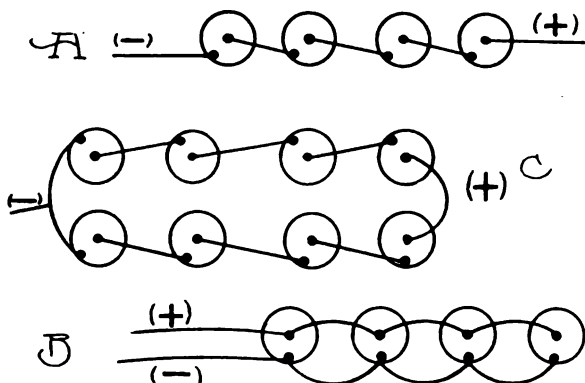
A series connection consists of joining the positive pole of one cell to the negative pole of another. This method is illustrated at A. If the voltage of one cell be $1\frac{1}{2}$ volts, the pressure between the + and — terminals of the battery is equal to the product of the voltage of a single cell multiplied by the number of cells. Thus connecting four cells in series, as shown, will produce a total of six volts.

Parallel, or multiple, connection is made by

connecting the positive terminal of one cell with the positive terminal of another and the negative terminal of the first cell with the negative terminal of the second. This arrangement is shown at B. When connected in this manner the voltage of the battery is the same as that of a single cell, but the current is equal to the amperage of a single cell multiplied by the number of cells. If the dry cell be of $1\frac{1}{2}$ volts, 15 amperes, the total of the cells connected as shown would give 4×15 , or 60 amperes at a pressure of $1\frac{1}{2}$ volts.

A series multiple connection is shown at C. It consists of two series sets of cells connected in parallel. It is essential that when the cells be connected in this manner, the voltage of each set of cells must be equal, else the batteries will be weakened. Thus each battery of a series multiple connection should contain the same number of cells.

The voltage of a series multiple connection is equal to the voltage of one cell multiplied by the



How to Connect Batteries in Series, Parallel and in Series Multiple.

number of cells in one battery. The amperage is equal to the amperage of one cell multiplied by the number of batteries.

Harsh Meshing of Gears—G. R. K., Nashville, Tenn.

The transmission of my two-cylinder truck is of the progressive sliding gear type. This truck has always given good service, but when changing gears the meshing has always been accompanied by clashing. Do you know of any method whereby this condition can be avoided?

The clashing sound produced by the meshing of the gears can be eliminated by the use of the double clutching method. When making the change from low to second speed, speed the engine up a trifle and then depress the clutch pedal and place the gear shifting lever into neutral position. Next release the clutch pedal and after a short pause, again depress it. The gear shifting

(When Writing to Advertisers, Please Mention The Automobile Journal.)

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WADSWORTH-ALL SEASON

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For FORD TOURING CAR

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to run your Ford this winter without a limousine top like this? The price is only \$60-Complete.

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 1298 Jefferson Avenue — **DEALERS** — Detroit, Michigan

There is a golden opportunity for the man who is prepared to supply the demand for Wadsworth all-season tops. The Ford is everywhere. Write immediately for details of our Co-operative Dealer Plan. Liberal discounts to Wadsworth agents. Big profits are in store for wide awake men who act quickly. Just a suggestion—the telegraph is quicker than the mails.

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 New England Dealer for

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NORDYKE & MARMON CO., Indianapolis, Ind.

The Quality Car



1916 Model
Metz "25" Roadster

METZ

"25" Roadster, 1916 model. Price \$600, completely equipped. Built on same chassis as Touring Car, with 108-

inch wheel base and carries identical equipment, including electric starter and electric lights, 25-horse power water-cooled motor, large wheels and tires, rain vision wind shield, instant one-man top, speedometer, built-in gasoline gauge, signal horn, etc. A wonderful hill climber, and for reliability in road performance is absolutely unsurpassed. Write for DEALER particulars and new illustrated catalog "Q."

NOTE—The Metz "25" Touring Car, 1916 model, completely equipped as above described, is also listed at \$600.

METZ COMPANY, WALTHAM, MASS.

WHY FREEZE YOURSELF RUIN YOUR AUTO ?

Write for full particulars



HEAT YOUR GARAGE WITH A
"SUPERIOR"
SAFE GARAGE HEATER

Burns Natural or Artificial Gas
Needs Be Lit but Once a Year—Pilot Light
No Gas or Fumes Can Enter Heater

SUPERIOR MFG. CO., N.S., Pittsburgh, Pa.

AUTOMOBILE ELECTRIC LIGHTING SPECIALTIES

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who wants SERVICE for his money

ELECTRIC LIGHTING SPECIALTIES Made to Order

CULVER-STEARN'S MFG. CO.

Worcester, Mass

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Peerless Quality in Smaller Size

"ALL PURPOSE" FOUR AND SIX
FOUR AT \$2,000 (Sixes \$250 Extra)

THE PEERLESS MOTOR CAR CO., CLEVELAND, OHIO
Makers also of the "48-Six" and Peerless Trucks.

Licensed under The Kardo Patents.

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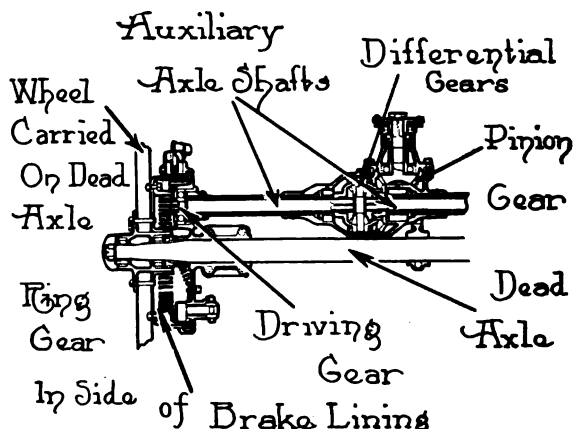
lever can now be moved silently into the second speed position. The same method is applicable when building or reducing gear ratios. It will, however, require practise before the operator becomes proficient in this method, as the operations must take place within a comparatively short period, so as not to lose the momentum of the car. The reason for the clashing sound is that two gears are being meshed while rotating at different speeds.

Internal Gear Drive—R. H. S., Charleston, S. C.

Will you kindly explain the working principle of the internal gear drive as used on some trucks? What advantage is claimed for this construction?

The internal gear drive consists of a combination of a dead rear axle, as used in the chain drive, and a bevel gear rear axle drive with internal spur gears. The construction is shown in the accompanying illustration.

The wheels and load are carried by the dead



Components of an Internal Gear Drive System.

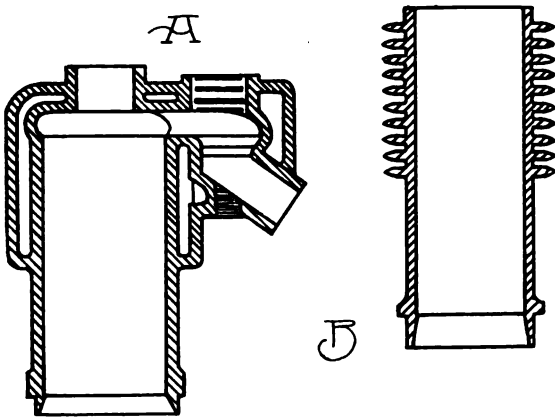
axle. The power is transmitted by a bevel pinion gear, attached to the end of the drive shaft, to the ring gear of the differential. This differential is similar in construction to that of the bevel gear drive commonly used in pleasure cars. These gears are enclosed in a housing which is securely attached to the dead axle. The rotary motion is transmitted through auxiliary axle shafts to spur gears at the ends. These spur gears mesh with ring gears attached to the inside of the brake drums, as shown.

The gear reduction is accomplished by the difference in size of the spur gear attached to the end of the auxiliary axle shaft and the ring gear inside of the brake drum. The main advantage claimed for this construction is that the weight of the car and load is carried by a dead axle, thus placing no strain on the working mechanism.

COOLING SYSTEMS.

Experts have determined that the heat produced when a proper mixture of gas and air is ignited, is equal to 2730 degrees Fahrenheit. It is obvious that if some provision was not made for reducing this intense heat it would cause the metal to swell and result in an inoperative motor. Hence the process of maintaining the walls of the cylinder at the proper temperature. The most common method is by casting jackets integral or forming them around the cylinder, so that water can be either forced through mechanically or by natural circulation. The usual construction of a water cooled cylinder is shown in the accompanying illustration at A.

Many motors, however, use absolutely no water in the cooling system, but rely wholly on air. In that case, numerous flanges, or radiating fins, are cast integral with the cylinder. The heat passes to the ends of these fins, where it is easily



Difference in Constructional Features of Water and Air Cooling Systems.

reduced by the force of air that is directed usually by a fan to the pins. The sketch B illustrates a form of air cooled cylinder.

CLEANING GASOLINE SYSTEM.

There is a strainer, or tap, in practically every gasoline line. Few persons ever think of removing the foreign matter that has collected there until trouble crops out. With the present day fuel much trouble can be prevented by the occasional opening and cleaning of the trap.

A reamer should never be used to enlarge or true the inside of a pipe. The flux used in welding forms a scale which is exceptionally hard and deleterious to the reamer.

(When Writing to Advertisers, Please Mention The Automobile Journal.)



How Many Cars Have Hides

(A Sequel to "How Many Hides Has a Cow?")

MORE cars are now upholstered in Du Pont Fabrikoid than in any other material.

The number upholstered in leather, counting all grades, is steadily diminishing. About 20% of the new 1915 cars were upholstered in hides or hide splits. About 10% were upholstered in cloth. Of the remaining 70% upholstered in leather substitutes, the majority were in Du Pont Fabrikoid, Motor Quality.

Four years ago nearly all automobiles were upholstered in good leather, but 1915 production was just about twice that of 1912; in the meantime the steadily decreasing hide supply has made prices soar.

The attempt to meet this famine in real grain leather, by using and selling doctored splits as "genuine leather" has been a failure. The public has learned the difference, and today automobile manufacturers face the choice of real grain leather or its nearest popular competitor, Du Pont Fabrikoid.

Real grain leather, because of scarcity and high price, is out of the question for popular priced models. Coated splits, masquerading as "genuine leather," have proved impractical, therefore the decision of the greatest makers of popular priced cars has been in favor of Du Pont Fabrikoid, proved the most desirable after several years use on hundreds of thousands of cars.

Du Pont Fabrikoid is **not** leather, but has all the artistic appearance and luxury of real grain leather. In addition, it is waterproof, washable and grease proof, and will outwear the grade of "genuine leather" used on 90% of the cars that "have hides."

Fabrikoid Rayntite Tops guaranteed one year against leaking, do not get shabby because they are built to last.

Booklet and small sample of Motor Quality sent free.



Du Pont Fabrikoid Co.

Wilmington, Delaware

(Works at Newburgh, N. Y.)

Canadian Sales Office, Toronto



DON'T GAMBLE WITH SAFETY

WHEN car brakes in good adjustment will not hold a machine on any grade, or stop it quickly, the safety of life and property demands re-lining the shoes—not later, but at once.

Efficient brake shoes ought to engage easily and gradually and not slip after the wheels lock. When brake shoes "chatter" new lining is needed. If brakes cannot be relied upon, don't take a chance.

No brake lining is safe to use unless it is heat-resisting, is not affected by water, dust, oil or gasoline, and will endure in any service. Good brake lining is the cheapest insurance known.



It is a guaranteed product, made in all standard widths and thicknesses, that is sold by all leading dealers or can be obtained direct.

The economy of brake lining is not in the first cost, but in the service life and the protection you are sure of. Yet S-M-C Brake Lining costs no more than cheaper made lining.

"Why Gamble With Safety"

"SOMETHING MOR'N COTTON."

STAYBESTOS MFG. CO.

Germantown, Philadelphia, Pa.

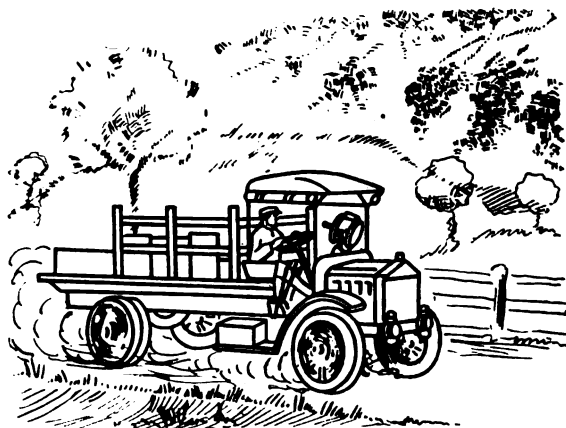
Makers of Asbestos, Rubber Packings, Gaskets and Radiator Hose, Etc.

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NEW POSITION FOR LAMPS.

A Massachusetts truck driver, who does much operating at night, suggests that oil side lamps can be made much more efficient by changing their position on the car, as shown in the accompanying illustration. They have been moved to the front of the bumper. This arrangement brings the light nearer to the road and will produce ample illumination for a distance of about 10 feet. This position also affords a more restful effect on the eyes of the operator, who does not have to look through the light to see the road. The same lamp brackets were used and holes drilled and tapped in the bumper to receive cap screws.

This driver uses the swivel type of acetylene headlight. For driving purposes the lamp is set to cast the light rays directly on the road and consequently there is no glare to bewilder on-



Lamps Located on Bumpers to Aid in Lighting Road.

coming traffic. This type of light is also useful for reading street signs and house numbers.

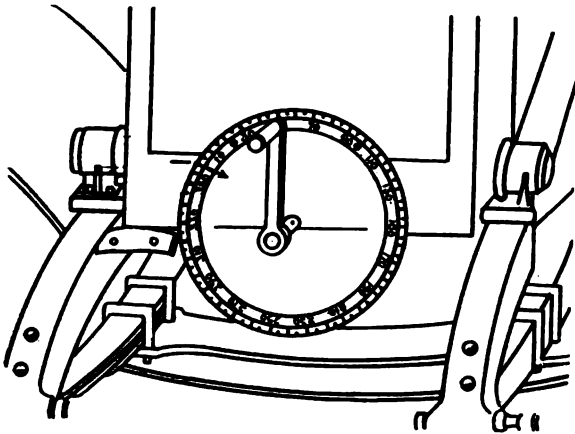
VALVE AND IGNITION TIMING.

In a recent issue of Autocar, an English publication, there appeared an interesting article relative to the testing of valve and ignition timing. Although the method suggested is not an absolutely accurate test, it is near enough to form a practical check on the timing. The only material required is a piece of stiff cardboard, cut in the form of a 20-inch disc.

A hole of the same size as the shank of the starting handle is cut in the centre of the disc, and then a small slit made so that the cardboard can be placed over the handle. The edge of the disc is then marked off by divisions of five degrees into a circle of 360 degrees.

The next operation is to find the dead top centre of No. 1 piston. Usually this is marked on the flywheel, but if not, any of the methods heretofore described in these columns may be used. The placing of a wire on the piston head is one of the simplest methods. With the crank in mesh with the end of the crankshaft, when the dead centre of the No. 1 cylinder has been found, the disc should be turned so that the figure, 360 degrees, is directly behind the gripping portion of the handle. The disc can next be made stationary in this position by forcing long nails through the disc into a space between two of the radiator tubes.

Now turn the starting handle until the inlet valve of the No. 1 cylinder just starts to open. Mark I. O. just behind the gripping portion of the handle on the disc. This same procedure



A Practical Device for Testing Valve and Ignition Timing.

should be followed at the closing of the inlet valve and also the opening and closing of the exhaust valve. Similarly the firing point can be checked. Of course a separate valve test should be held for each cylinder so that perfect synchronism can be obtained.

With a device of this type it is a simple matter to find the dead centre of the crankshaft and then permanently to mark the flywheel. The best method is to mark the flywheel and also the back cylinder, or dash, so that it will serve as a register for the mark on the flywheel. It is also well to make a small mark on the radiator so that the disc can be replaced at any time with a degree of accuracy.

It should be remembered that the starting crank can engage the crankshaft in either of two positions. To ascertain that the proper engagement has been made, the operator should watch the exhaust valve, as it should be practically closed when the piston has reached top centre.

(When Writing to Advertisers, Please Mention The Automobile Journal.)



A Passing Remark

Tom—"Gee, you look dry and comfy."

Jim—"You bet 'cha. I just had my top waterproofed with Mansfield Never-Leak Dressing. Did it myself. Only cost me \$1.75. A half gallon can will cover a 5-passenger top. A quart can and a dollar would cover your roadster."

MANSFIELD'S NEVER-LEAK

Tom—"Wonder if it would waterproof my top? It's full of pinholes and cracks."

Jim—"Yep, the manufacturers absolutely guarantee it to do just that little thing."

Tom—"Where do you get it?"

Jim—"The factory will send it to you if your dealer don't sell it."

MANSFIELD MFG. CORPORATION

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Syracuse, N. Y.

Dealers! Hook up to this wonderful seller. Every auto owner a prospective customer.

SUPREME AUTO OIL

FLows FREELY AT ZERO STARTS WITH THE ENGINE

This permits the use of a medium instead of light oil during the winter months, and affords better lubrication.

Any dealer displaying the Sign of the Orange Disc will supply SUPREME AUTO OIL.

There is More Power in
THAT GOOD GULF GASOLINE and
SUPREME AUTO OIL

We have an attractive proposition for dealers.

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The largest independent refining company in the world.



S. J. R. \$885

THREE-PASSENGER ROADSTER

A superb machine in design and construction, with every quality of the highest priced car. Unit 25-30 horsepower power plant, selective sliding gear three-speed transmission gearbox, full-floating rear axle, cantilever springs, single-unit starting and lighting system, 108-in. wheelbase, 56-in. tread, Hook wire wheels, Q. D. 30x3 1/2 tires, with up-to-the-minute equipment. The ideal aristocratic car for all-around service.

The greatest car value of the year. For open territory write.

S. J. R. MOTOR COMPANY

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Distinct Books—1000 Pages of Text—All Copies Indexed—2000 Illustrations, Including Practical Working Page Charts and Trouble Finders.

Books written by recognized authorities. Especially prepared for those who have to do with the sale, care, repair and operation of motor vehicles, their parts, equipment, accessories, etc.

The practical information in these works cannot be secured through any other series or number of books or for 50 times what is charged for this library.

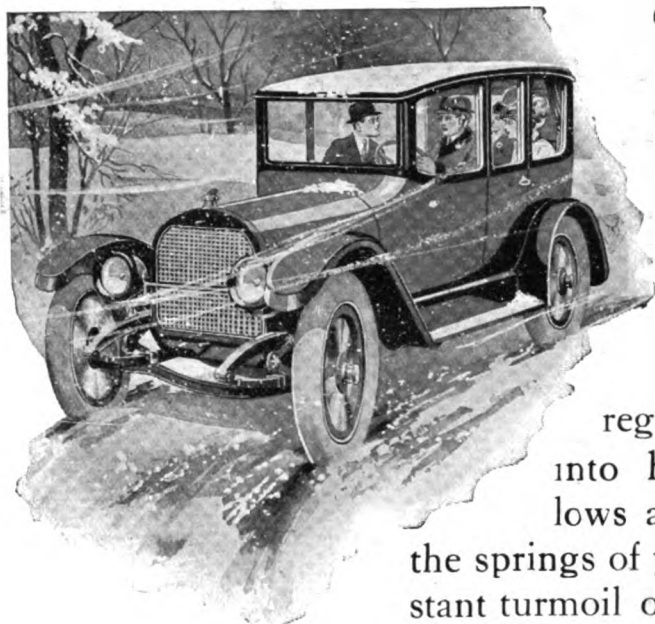


Engine	.	.	35c	Chassis	.	.	25c
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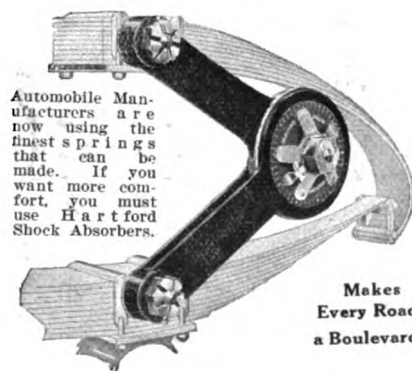


For Motoring Comfort over Hard, Winter Roads

WHEN the frost has stiffened every irregularity of road surfaces into hard, jolt-imparting hollows and bumps, which keep the springs of your automobile in a constant turmoil of action, the need of the

★ *Hartford* SHOCK ABSORBER

becomes decidedly apparent. The Hartford takes the sting out of every jolt, makes your springs act smoothly and normally, carrying you over road irregularities glidingly, undulatingly, comfortably.



SEND TO US FOR OUR COMFORT CHART

It tells how to realize riding comfort, no matter where or how fast you choose to motor.

It gives data pertaining to your particular car, whatever its make, year and model.

Free to Car Owners

It is then that you realize that all-the-year riding comfort is only possible with Hartford Shock Absorbers on your car.

HARTFORD SUSPENSION COMPANY

147 Morgan St. E. V. HARTFORD, President. Jersey City, N. J.

Makers of the Hartford Cushion Spring, Hartford Electric Brake, Hartford Auto Jack, Hartford Bumper.

BRANCHES: Boston, 319-325 Columbus Avenue; Chicago, 2637 Michigan Avenue; New York, 1846 Broadway and 212-214 West 88th Street; Indianapolis, 425 North Capitol Boulevard.

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4 CYLINDER 6 CYLINDER
MAGNETO

Leading automobile manufacturers are convinced as to the absolute superior merits of DIXIE magnetos for dependable ignition and are equipping their cars with them in increasing numbers.



SPLITDORF
NEWARK,

(When Writing to Advertisers, Please Mention The Automobile Journal.)



DIXIE

8 CYLINDER 12 CYLINDER
20TH CENTURY IGNITION

Automobiles with DIXIE Magnetos have an independent source of supply for their ignition. They do not depend upon any other *auxiliary* system.

ELECTRICAL CO
NEW JERSEY.



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REO

This Is Reo Year

EVERYTHING POINTS to that—everything indicates not only that the coming year will be the greatest Reo has ever known, but that the Reo policy and product will exert a greater influence on the automobile industry than ever before.

ALREADY YOU'VE NOTICED the tendency to emulate Reo in many features of design and construction—the "Sheerline" body of the New Reo Six is the acknowledged fashion plate, while Reo cantilever springs, Reo control and countless other mechanical features are being imitated as nearly as may be.

BUT AS THE YEAR PASSES you'll see more evidence of Reo influence on the trade generally.

FOR EXAMPLE, there's a greater divergence of engineering ideas this year than ever before. There's more types of motors and of cars—and no one dominant type.

OUT OF THAT CONFUSION—that babel of tongues arguing about and disputing over countless new and radical ideas—will come the decision that most or all of them are only engineering fallacies.

REO HAS BEEN CRITICISED for what some term our ultra-conservatism.

WE DON'T MIND—that has been the chief factor in the splendid Reo success. We don't change easily or often, so we make less mistakes than others.

WE DON'T EXPLOIT our friends—so we keep them. We hold as sacred the confidence of Reo buyers—and as a result, this industry knows nothing that quite equals the loyalty of the Reo clientele.

AND SO WE SAY that this year of radicalism; this year of wild experimenting; this year of confusion will prove to be the Reo year—because it will vindicate as no other year ever has, the Reo policy.

IF YOU ARE of an inventive or an adventurous turn, this is a great year to gratify your propensity for experimenting.

BUT IF YOU ARE one of those more serious minded persons who want value for your every dollar; who buy an automobile for service, not for the stunts it will perform:—

AND ABOVE ALL, if you'd be certain when you draw your check that you are getting the best there is to be had in Simon pure automobile value and the lowest in maintenance cost—then come along with us—for this is Reo Year.

Reo Motor Car Company, Lansing Michigan. U. S. A.

(118)

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Opportunity

Scripps-Booth luxurious light cars handled from your sales floor enable you to call on the best types of buyers in your community as sales possibilities. This type knows quality, and is the easiest class of society to convince of quality when quality actually exists.

The wonderful appeal of Scripps-Booth art lines, mechanical perfection and riding luxury, make this car the ideal for those now possessing the heavier big car construction.

The recent addition of an eight-cylinder chassis and four-passenger model to the line of roadsters already so remarkably known, brings a new opportunity to every dealer in territory which may not now be covered by the Scripps-Booth organization.

A failure to investigate this opportunity may mean a later regret.

Scripps-Booth Company

Detroit, Mich.

EXHIBITING ON MAIN FLOOR OF ARMORY

Four-Cylinder Roadster	\$825.00
Eight-Cylinder, Four-Passenger	1,175.00
Four-Cylinder Coupe	1,450.00
Eight-Cylinder Speed Model	1,250.00



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UNEQUALLED FOR QUALITY THE WORLD OVER

The wrench is the most used and the most useful tool in a motorist's kit.

COE'S Special Automobile Model is a perfect tool. The jaws are hardened special quality tool steel to withstand hard usage, and the handle is long to afford great leverage. The wrench is thin to work in space inaccessible for ordinary wrenches.

Coe's Special Automobile Model wrench is a tool kit in itself. Coe's quality costs slightly more, and it is worth many times the price of any other tool. A Coe's is always dependable, in the garage or on the road. Literature sent at request.

COE'S WRENCH COMPANY WORCESTER, MASS.

Distributors: { J. C. McCarty & Co., 21 Murray Street,
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Inter-State

See This Unusual Show Display



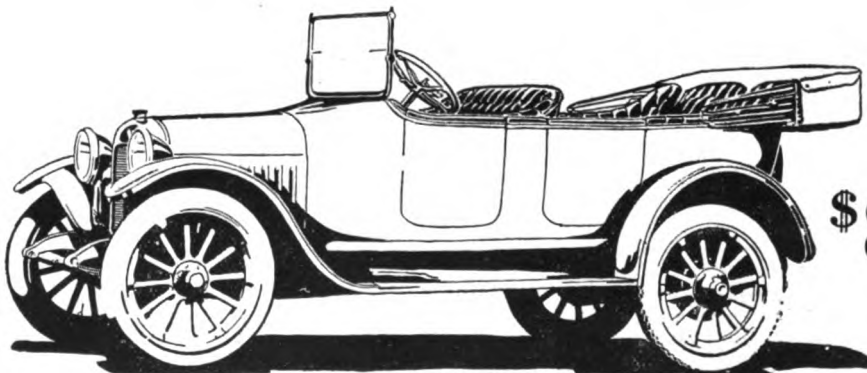
HUNDREDS of owners prove beyond a doubt the value of Inter-State power, comfort and beauty. No claims, no promises, no experiments—just honest, convincing *value testimony*.

It gives you your first opportunity to see and judge a car—not through the eyes of those who made it—but through the experience of *those who use it*.

Dealers and owners both will find here an idea far above any wonderful change in design and construction. If you want to know about *proved value* and *actual assets* for either the man who buys or sells cars—see us.

Space Q-3 Chicago Show
Coliseum Annex

Inter-State Motor Company
Muncie Indiana



\$850

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(Yearly Advertisers Only Are Listed in This Guide.)

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Auto Parts Co., Providence, R. I.
Faw, J. H., Inc., 41 Warren St., New York City.

Times Square Auto Co., 56th St., at Broadway, New York City.

AIR COMPRESSORS AND TANKS.

Brunner Mfg. Co., Main Office and Factory, Utica, N. Y.; New York Office, Hudson Terminal Bldg., 30 Church St. (Brunner.)

Williams Foundry & Machine Co., Akron, O.

AIR PUMPS.

Gardiner Governor Co., 126 Williamson St. Quincy, Ill.

Lipman Air Appliance Co., 199 Pleasant St., Beloit, Wis. (Portable, Stationary.)

ANTI-BATTLERS.

King Specialty Mfg. Co., Brookline, Mass.

AUTOMOBILE ACCESSORIES.

Motorcycle Accessories Co., St. Paul, Minn.

AUTOMOBILES. (See Cars.)

AUTO PRESS.

United Eng. & Mfg. Co., 180 Pearl St., Hanover, Penn. (Manley Universal Auto Press.)

AUTOMOBILE SPECIALTIES.

Motor Specialties Co., Waltham, Mass.

AUTO SPRINGS. (Boltless.)

Harvey Spring Co., 851 17th St., Racine, Wis.

AUTO STORAGE COVER.

Kennedy Car Liner and Bag Co., Shelbyville, Ind.

AXLES.

Russel Motor Axle Co., North Detroit, Mich. (Internal Gear Drive.)

BALLS AND BALL BEARINGS.

Ahlberg Bearing Co., 2624 Michigan Ave., Chicago; 1790 Broadway, New York City; 805 Woodward Ave., Detroit.

Marburg Bros., Inc., 1790 Broadway, New York. (S. R. O.)

New Departure Mfg. Co., Bristol, Conn. (New Departure.)

Norma Co. of America, 1790 Broadway, New York City. (Norma.)

BODIES—WOOD AND METAL.

Springfield Metal Body Co., 20 Medford Ave., Springfield, Mass.

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Harvey-Spring Co., 851 17th Street, Racine, Wis.

BRAKE BANDING OR LINING.

Standard Woven Fabric Co., Framingham, Mass. (Multibestos.)

Staybestos Mfg. Co., Lena and Armat Sts., Germantown, Philadelphia, Penn. (Staybestos.)

Thermold Rubber Co., Trenton, N. J.

BRUSHES, WIRE.

Williams Foundry & Machine Co., Akron, O.

CABLE, AUTOMOBILE.

Faw, J. H., Inc., 41 Warren St., New York City. (Standard American.)

Packard Electric Co., The, Warren, O.

CARBON REMOVERS. (See Cylinder Cleaning Compound.)

CARBURETORS.

Zenith Carburetor Co., Detroit. (Zenith.)

CARS—GASOLINE PLEASURE.

Inter-State Motor Co., 804 West Willard St., Muncie, Ind. (Inter-State.)

Metz Co., Waltham, Mass. (Metz.)

Nordyke & Marmon Co., Indianapolis. (Marmon.)

Peerless Motor Car Co., Cleveland, O. (Peerless.)

Pierce-Arrow Motor Car Co., Buffalo, N. Y. (Pierce-Arrow.)

Reo Motor Co., Lansing, Mich.

Scripps-Booth Co., Detroit. (Scripps-Booth.)

S. J. R. Motor Co., 126 Massachusetts Ave., Boston, Mass.

Stutz Motor Car Co., Indianapolis. (Stutz.)

White Co., Cleveland, O. (White.)

Willys-Overland Co., Toledo, O. (Overland.)

Winton Co., 131 Berea Road, Cleveland, O. (Winton.)

CARS—GASOLINE COMMERCIAL.

Chase Motor Truck Co., 106 West St., Syracuse, N. Y.

Duplex Power Car Co., Charlotte, Mich. (Duplex.)

Federal Motor Truck Co., Junction and Leavitt Sts., Detroit. (Federal.)

Gramm-Bernstein Co., Lima, O.

Independent Motors Co., Port Huron, Mich. (Independent.)

International Motor Co., 64th St., and West End Ave., New York, N. Y. (Mack.)

Kissel Motor Car Co., 196 Kissel Ave., Hartford, Wis.

Locomotive Company of America, Bridgeport, Conn.

Packard Motor Car Co., Detroit, Mich.

Peerless Motor Car Co., Cleveland, O. (Peerless.)

Pierce-Arrow Motor Car Co., Buffalo, N. Y. (Pierce-Arrow.)

Reo Motor Co., Lansing, Mich.

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Sullivan Motor Car Co., Rochester, N. Y. (Sullivan.)

White Co., Cleveland, O. (White.)

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Heinze Electric Co., Lowell, Mass.

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Pierce Speed Controller Co., Anderson, Ind.

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King Specialty Mfg. Co., Brookline, Mass. (King.)

CYLINDER CLEANING COMPOUND.

Dyer Apparatus Co., Cambridge, Mass. (Oxy-Carbon.)

ELECTRIC LIGHTING EQUIPMENT.

Carleton Co., The, 172 Summer St., Boston. (New Carleton No. 68.)

Culver-Stearns Mfg. Co., Worcester, Mass.; Detroit.

Disco Electric Starter Corp., Detroit, Mich.

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American Bureau of Engineering, 1526 Wabash Ave., Chicago, Ill. (Ambu.)

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Superior Lamp Mfg. Co., 136 W. 52nd St., New York, N. Y.

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Hunter Auto Supply Co., Hunter Bldg., 332 W. Madison St., Chicago, Ill. (Hunter.)

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Walden Mfg. Co., 78 Commercial St., Worcester, Mass.

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Four Wheel Drive Auto Co., Clintonville, Wis.

FUNNELS, AUTO.

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Jacobson Mch. Mfg. Co., Warren O. (Mascot.)

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Manufacturers' Engine Company, Kansas City, Mo.

GASOLINE ENGINES.

Manufacturers' Engine Company, Kansas City, Mo.

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Wayne Oil Tank and Pump Company, 2 Canal Street, Ft. Wayne, Ind.

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Detroit Radiator Specialty Co., 961 Woodward Ave., Detroit, Mich.

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JACKS.

Motor Specialties Co., Waltham, Mass. (Excel Auto.)

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 Mabey's Electric & Mfg. Co., Indianapolis. (Mabey's Electric Trouble.)
 Mueller & Co., E. S., 431 High Ave., S. E., Cleveland, O. (Clamp.)

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Elsemann Magneto Co., 32 33d St., Brooklyn, N. Y. (Elsemann.)

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Gibson-Hollister Mfg. Co., Boston, Mass.

Hartford Machine Screw Co., 512 Capitol Avenue, Hartford, Conn. (Master.)

Heinze Electric Co., Lowell, Mass.

Milwaukee Auto Specialty Co., 705-711 Chestnut St., Milwaukee, Wis. (Centerfire.)

Splittorf Electrical Co., 98 Warren St., Newark, N. J.

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Dover Stamping & Manufacturing Co., Cambridge, Mass.

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Knox Motor Associates, Springfield, Mass. (Knox.)

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Boston Blacking Co., Boston, Mass.

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are unequalled for motor lubrication, freer from carbon, economical because they protect the motor against mechanical wear, and the quantity required is comparatively small.

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AND SUPPLY CO.
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Index to Advertisers.

	Page
Ahlberg Bearing Company.....	57
American Chain Co., Inc.....	18
Barrett Manufacturing Co.....	59
Bosch Magneto Company.....	59
Briscoe Motor Co.....	57
Church Engineering Co.....	10
Coes Wrench Co.....	6
Culver-Stearns Mfg. Co.....	57
Dixon Crucible Co., Jos.....	60
Dorsey Mfg. Co.....	62
Dover Stamping & Mfg. Co.....	56
Eagle Oil and Supply Co.....	10
Eisemann Magneto Co.....	55
Hartford Machine Screw Co.....	63
Hartford Suspension Co.....	1
Heinze Electric Co.....	56
Inter-State Motor Co.....	7
Marburg Bros.....	56
McQuay-Norris Mfg. Co.....	58
Mea Magneto Co.....	56
Mecca Mfg. and Spec. Co.....	10
Metz Company.....	60
New Departure Mfg. Co.....	56
N. Y. & N. J. Lubricant Co.....	58
Nordyke & Marmon Co.....	59
Peerless Motor Car Co.....	60
Pierce-Arrow Motor Car Co.	Cover
Reo Motor Car Co.....	4
Scripps-Booth Co., The.....	5
S. J. R. Motor Co.....	15
Splitdorf Apelco Co.....	Cover
Splitdorf Electrical Co	2-3-16-17
Split Hickory Wheel & Top Co.....	58
Springfield Metal Body Co.....	12
Standard Oil Co. of N. Y.....	61
Standard Woven Fabric Co.	Cover
Staybestos Mfg. Co., The.....	57
Stutz Motor Car Co.....	11
Superior Mfg. Co.....	60
Texas Oil Company.....	59
Thermoid Rubber Co.....	57
Times Square Auto Co.....	10
Tuttle & Bailey Mfg. Co.....	58
Valvoline Oil Company.....	59
Vanderpool Co., The.....	10

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Vanderpool, Springfield, O.

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**World's Road Race
Champion**

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**World's
Long Distance Records
250 mi. 300 mi. 350 mi.**

**Consistency
Four Consecutive
Firsts and Seconds**

THE same excellence in mechanical performance, the same careful proportioning of power to load, and balance to speed, that makes Stutz World's Champion in speedway, road racing and long distance events, makes Stutz World's Champion for daily service.

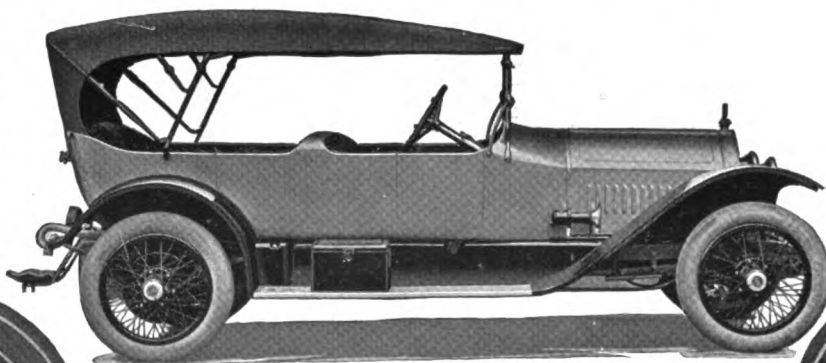
The same stamina that resulted in 4 consecutive firsts and seconds in the fastest gruelling events of 1915, means long and satisfactory service in your hands.

Stutz value is proven—Stutz consistency has been demonstrated repeatedly. Illustrated literature showing why you should see a Stutz dealer sent on request.

Stutz Motor Car Co.

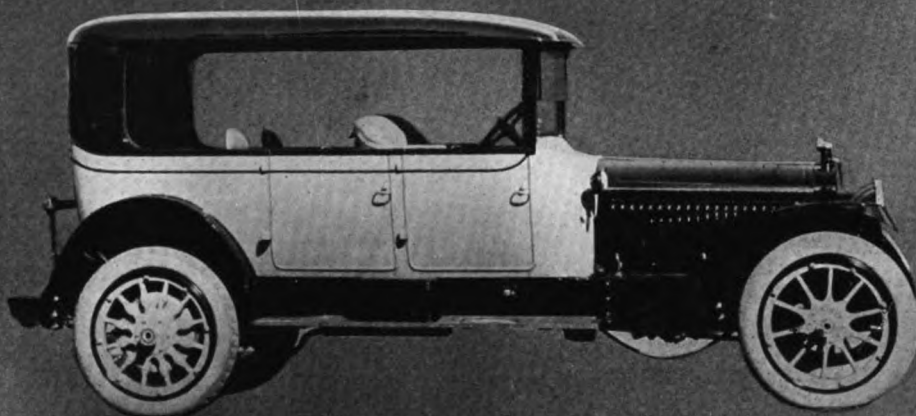
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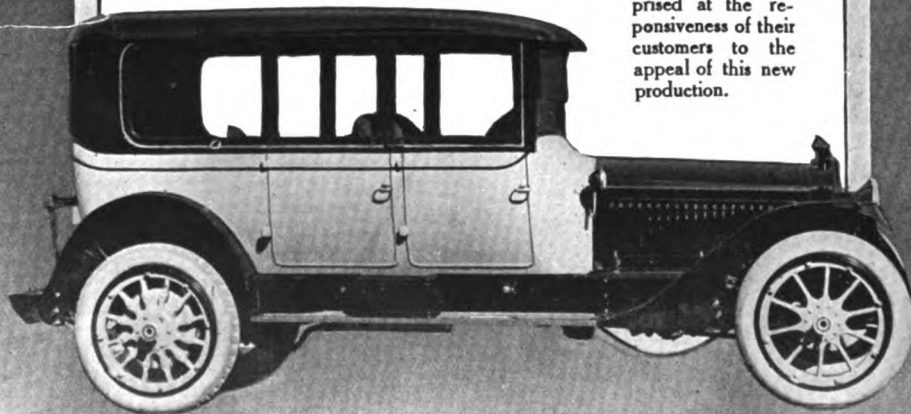
SPRINGFIELD CONVERTIBLE BODIES



THE limousine and the touring car are completely satisfactory only in certain seasons. The new Springfield Demi-Convertible body has no such limitations; it is the all-year, all purpose body.

More and more in America, as in Europe, the tendency is to demand protection from the sun, the dust and sudden showers even in touring. This body with its permanent top provides such protection, while it gives plenty of air and an unobstructed view. It may be converted into a limousine.

Dealers will be surprised at the responsiveness of their customers to the appeal of this new production.



SPRINGFIELD METAL BODY CO.
SPRINGFIELD, MASS.

BOSTON MOTOR TRUCK SHOW

March 4-11, 1916

THE BOSTON SHOW EDITION OF MOTOR TRUCK

Will Be Mailed February 25

The Boston Exhibition will be the only show of motor trucks of national importance of the year.

The entire section of the country from which this show will attract visitors is covered by the **Motor Truck** practically to the exclusion of all other publications devoted to highway transportation.

Publicity in this edition will reach every interest, it will be complete publicity for one expenditure, and circulation will not be duplicated.

The last form will close February 21.

THE MOTOR TRUCK

TIMES BUILDING

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BOSTON

DETROIT

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AUTOMOBILE JOURNAL PUB. CO.

Published the 10th and
25th of Each Month.
Ten cents a copy.

D. O. Black, Jr., Secretary.
Times Building, Pawtucket, R. I.

Entered as second class matter, April 45, 1906, at the Postoffice at Pawtucket, R. I., under Act of Congress of March 3, 1879

VOL. XI.

JANUARY, 25, 1916.

NO. 12.

PUBLISHER'S AND READERS' PAGE.

LAW Makers in Many States are giving their earnest attention to the matter of glaring headlights, and they are receiving the support of those motorists who have regard for the safety of themselves and of other motor car operators. It is a subject of vital importance to everyone who frequents the highways of either city or country. On page 39 of this issue the reader will find an exhaustive discussion of the subject of electric car lighting, particularly the proper construction of electric bulbs so as to overcome the tendency to give off blinding light rays. The author is a recognized authority on the subject. This discussion is largely academic, but in an early issue will appear another article on the subject that will prove of much service to the readers of The Automobile Journal by presenting practical advice regarding the best methods of dimming headlights.

A Practical Suggestion regarding the making of simple, but efficient dimming devices at home is offered in the Practical Motor Car Department. This suggestion is timely and is in keeping with the editorial policy of this magazine to always give its readers practical service. Other valuable information and suggestions are presented in the New Owners Department, which in this issue contains an unusually large number of answers to inquiries. This correspondence department is open to all readers, who should address their inquiries to the Mechanical Editor. If desired the answers will be sent direct, or they will be published in

the magazine for the benefit of all readers.

The Publisher has received several letters in which the writers commend the proposed increase of the size of the type page of The Automobile Journal to 7½ by 10 inches, the change to take place with the issue of the Feb. 25 number. That issue being the Boston Show Advance Number, will allow the Editor to obtain more satisfactory typographical effects in showing the models and the interior of Mechanics' hall, where the show is to be held. Likewise, the change is of proportionate interest and value to advertisers, because it will enable them to enhance the attractiveness of their displays.

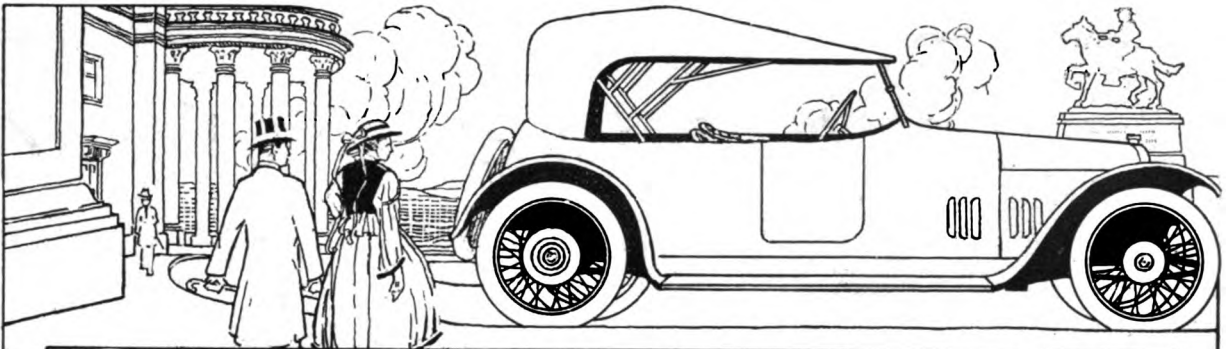
The Boston Show Advance Number will incorporate several new and original ideas in addition to the best of the usual special feature articles that have been customary in past years. One feature that makes the Boston show of particular value and interest this year is that it will be the only exhibition of motor trucks of national importance held in this country during 1916. Another is that it comes at the opening of the touring season, at a time when motorists are particularly interested in the new pleasure car models and the new accessories

and car equipments and are ready to buy, which fact accounts for the Boston show being known as a "selling show." This number alone will be worth the price of a year's subscription. Among other valuable features will be complete specifications of every gasoline and electric pleasure car made.

Partial Table of Contents.

	Page
*Motoring Above Clouds on Pikes Peak	19
*Chicago Show Has Exhibits Worth \$3,000,000	23
*General News of the Industry.....	25
Rhode Island's New Motor Car Code..	28
*Suggestions for the Ford Car Owner..	29
*The Oakland Line for 1916.....	33
*Overland Model 83-B Has Block Cylinders	36
*Electric Bulbs for Automobiles.....	39
Coming Events.....	43
*Industrial Happenings and Comment..	44
*Practical Motor Car Repairs.....	45
*Motor Starting and Car Lighting.....	47
Boston Traffic Arrangements.....	51
*Car Accessories and Equipment.....	52
*Practical Facts for New Car Owners...	54
*Readers' Queries.....	57

*Indicates article is illustrated.



SJR

Priced within the reach of every person who wants a thoroughly dependable car, with quality and appearance that will appeal to the discriminating motorist who wants the highest value obtainable for his money, the S. J. R. three-passenger roadster is distinctly alone in its class.

No machine of this type is as well designed, and none is so well constructed. It has every provision for comfort and convenience, it has unusual power, it is extremely economical of fuel, lubricant and tires, and it is finished and equipped equal to machines of several times the market value.

The S. J. R. car is 108-inch wheelbase and standard tread. It has a four-cylinder 25-30 horsepower engine, with cylinders cast en bloc; cooled by thermosyphon circulation; high-tension magneto ignition; multiple disc clutch, selective three-speed ratio and reverse sliding gear transmission gearset; full-floating rear axle; cantilever rear springs; left side drive and centre control; irreversible steering gear; Houk wire wheels; 30 by 3½-inch tires on Q. D. rims; natural wood instrument board with all fittings flush; single-piece clear vision windshield; one-man top; electric starting and lighting system; wheel carrier with extra wheel and tire.

*No car at the national display received as much attention.
It is the car of its class for 1916.*

Detailed information and specifications forwarded at request.

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A TYPE *for every*



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Long
Type

Curtiss
Aeroplane
Type

Standard
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Dayton Motorcycle


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Open End



Buick
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Vim and
Wichita Falls
Truck
Equipment



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Motorcycle
Equipment

Pope
Motorcycle
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1916 Equipment

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The Hovering Peril

Danger is ever waiting—lurking—watching for its victims—

—every day, every hour—yes, every minute—he somewhere collects his ghastly toll.

—he follows the gliding ship across the sea—the speeding train upon the rails—the auto spinning along the quiet country road or darting through the crowded city streets.

Wherever man may be—there, too, ever is Danger, or "The Hovering Peril".

Yet some men laugh at peril—they do not seek to avoid danger—and they have no fear because they have no prudence.

Strange, is it not, that they imagine folly is bravery—that they do not distinguish between cowardice and caution—and when disaster comes as the punishment of their imprudence, they, with blind superstition, believe that it was "fate".

■ They do not see "The Hovering Peril"—yet it is no phantom—it is a reality!

Men who have reasoning brains take precaution to avoid danger—not through any cowardly fear—but because they know that "The Hovering Peril" ever threatens their safety.

—it ever threatens you!

You who motor over muddy roads and wet, slippery pavements with Foolish Dependence Upon Bare Rubber Alone—when a false turn—a sudden meeting at a corner—a slip—or a skid!

—May mean your instant death!

You who are now so full of life—of ambition and the joy of living—may then pay the supreme penalty of your carelessness.

Why not take precaution now? You know the folly—the danger—the peril there is in driving a car over slippery roads and pavements without Weed Chains. You know that Weed Anti-Skid Chains make skidding Utterly Impossible—then why don't you get them today?

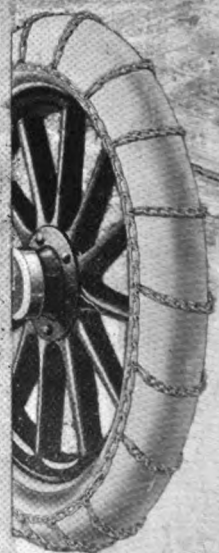


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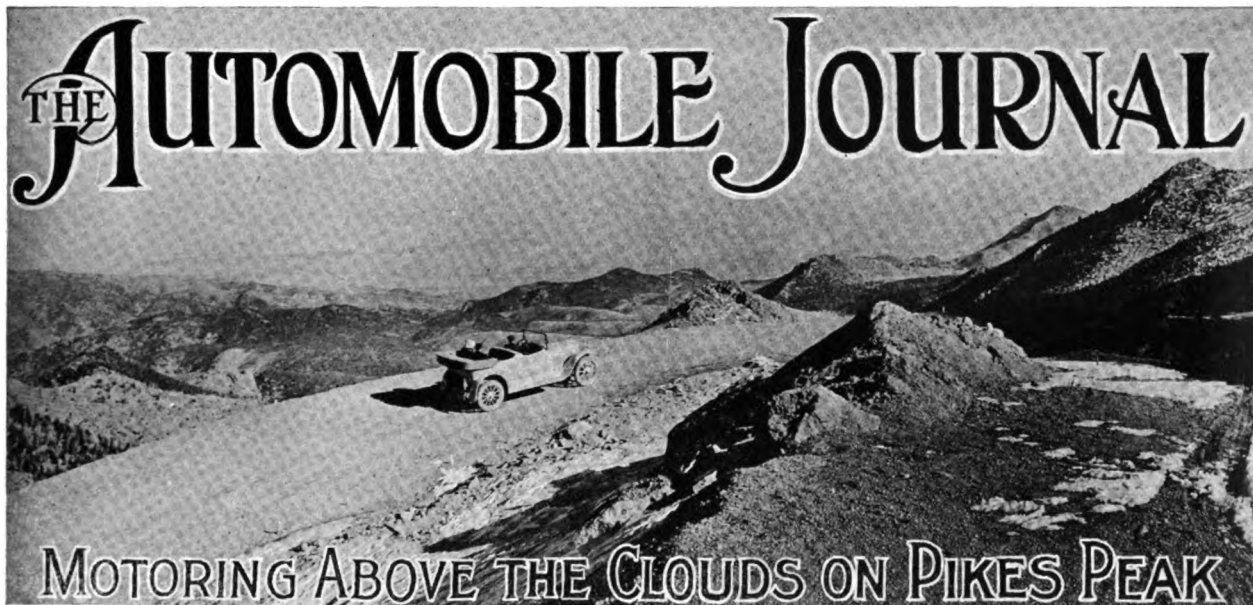
American Chain Co. Inc., Bridgeport, Conn.

Sole Manufacturers of Weed Anti-Skid Chains

Manufactured for Canada by Dominion Chain Company, Limited, Niagara Falls, Ontario, Can.



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By N. L. DREW.

A GAIN have the eyes of motordom turned westward to the nation's playground to witness the virtual completion of the Pikes Peak auto highway, highest and most wonderful of the earth's motor roads. The road is wonderful in its marvelous engineering triumphs; wonderful in that it reaches into the clouds 14,109 feet above the sea and still more wonderful in the magnificence of its scenery.

Climbing as it does, the north or precipitous side of the mountain, every mile is crowded with scenic interest. From its terminus more miles of mountain and plain are visible than from any other point on the globe reached by automobile. Sixty thousand square miles in one vast, limitless view, with a downward sweep to a greater depth than the Grand Canyon or Arizona; 8109 feet from the snow-clad summit to the rolling plain below; while indented on the western sky are a thousand pallid monsters of the Rockies, sublime in their massive grandeur.

Long has Colorado Springs dreamed of such a road. Many efforts were made to have it

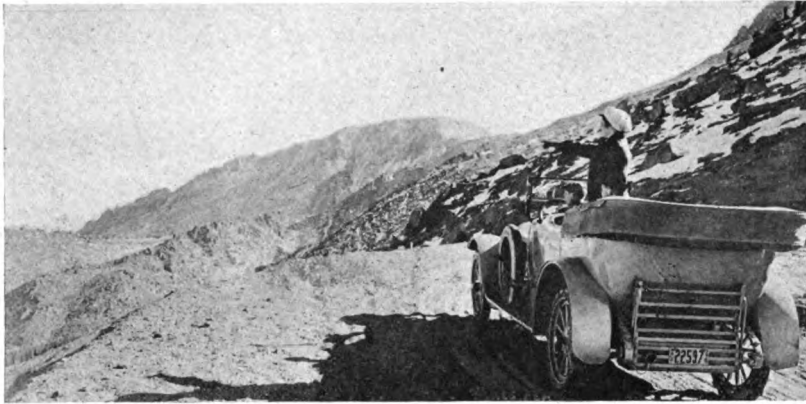
built, but owing to the tremendous obstacles its construction presented, all were failures. At last, realizing the great importance that such a road would be to Colorado, Eugene A. Sunderlin of Colorado Springs, a prominent railway executive, who at one time had the distinction of being the youngest railway president in the United States, set about over a year ago to overcome these obstacles. Consultations were had with city, county and state authorities and they resulted in a petition being made to the United States Forest Service for a permit for a toll road through the Pike National Forest Reserve. The department,

finding public sentiment unanimously in its favor, granted the permit without delay. Pledges of financial support were secured from Spencer Penrose, prominent in financial affairs of Colorado; Charles M. MacNeill, copper magnate of New York and Colorado Springs; William A. Otis, investment banker of the city; Albert E. Carlton, Cripple Creek mining man, and other public spirited citizens who were willing to give of their gold to promote the welfare of the com-

LOG OF PIKES PEAK AUTO HIGHWAY.

Initial point, Cascade, Col., 12 miles west of Colorado Springs—7415 feet above sea level.

Mile		Elevation	Rise
Post		Ft.	Ft.
1	Climbing Cascade Mountain...	7,795	380
2	Climbing Cascade Mountain...	8,310	515
3	Observation Point	8,595	285
4	Following Cascade Creek.....	8,945	350
5	Crystal Creek Summit.....	9,205	260
6	Crystal Creek Plateau.....	9,355	150
7	Skirting the Range.....	9,540	185
8	Skirting the Range.....	9,960	420
9	Climbing Front Range.....	10,465	505
10	Climbing Front Range.....	10,955	490
11	Glen Cove Amphitheatre.....	11,425	470
12	Timberline	11,880	455
13	Climbing on the W's.....	12,350	470
14	Climbing on the W's.....	12,835	485
15	Crest of Rampart Range.....	12,970	135
16	On Top o' the World.....	13,175	205
17	Little Pikes Peak.....	13,680	505
17.9	Summit of Pikes Peak.....	14,109	429
U. S. G. S. elevation Pikes Peak.....		14,109 feet	
Total rise			6,694 feet



At Mile Post 14 on the Crest of the Rampart Range from Which 300 Miles of Giant Peaks Mantled in Snow Are Visible.

munity in which they lived.

Thus in May, 1915, the titanic undertaking was begun under the personal direction of Mr. Sunderlin, its builder. His specifications were not merely for an ordinary road, but a double track mountain boulevard wide enough so that two machines might go abreast or pass at any point from its beginning to end. "Safety First" was the keynote of construction—and lastly, but of prime importance—the grade was not to exceed 10 per cent.

Construction camps were established every mile or so. Experienced rock workers and tons and tons of powder were brought in to force the way through fields of massive boulders and up the sheer granite walls of the peak. Nearly a car load of high explosives were required for each mile of road. Finish gangs with wide tired "Good

Roads" trucks followed in their wake to pack and smooth the surface.

What sort of a road has this builder built? Not only has it been made double track all the way, but three and four machines may go abreast at many points. Wide pull outs are provided at the more interesting points for rest and an uninterrupted view of the magnificent scenery. The grade has been held to an average of six per cent., with a maximum of 10 per cent., so that

any machine may climb to the summit with comparative ease. All the sharpest curves are 26 to 50 feet wide and superelevated. Masonry parapet and curve guard rail walls are provided where needed. Staunch bridges of reinforced concrete of the ballasted deck type are located on tangents only and may be seen 300 feet away. The minimum sight distance is 200 feet, except in two places, where but 125 feet could be obtained. The average is 400 feet. Surface ditches are dug continuously on the upper edge, with Armco pipe culverts set in concrete headings to carry the water away. Up to date gravity or wind mill tank and hose water stations are spaced every third mile, with automobile supply stations at convenient points. Local and long distance telephone stations afford communication with the outside world.



Mile Post One, Climbing the Forested Side of Cascade Mountain—Though the Rise in the 18-Mile Trip Is 6694 Feet, the Average Grade Is but Six Per Cent.



Climbing Front Range on the Way to Glen Cove Amphitheatre, Two Miles Above Sea Level.

The cross section of the road is a parabolic curve and surface material is nearly all of a disintegrated granite formation, which is exceptionally easy on tires. Each mile, with its elevation, is announced by metal sign posts. Each curve has its signal. It is also the intention to build a beautiful Swiss chalet at Glen Cove, a natural amphitheatre near timberline in mile 11, where the traveller may enjoy the solitude of the mountains and drink of the cold, pure water that gushes out of the rock walled side of the mountain.

Anyone may drive his own machine to the summit and in addition a large fleet of automobiles have been provided to carry tourists from Colorado Springs and Manitou. The round trip can be made in five hours.

The new highway offers ideal conditions for a "supreme hill climbing" test, and plans are al-

ready under way for such a contest to be held this year. Substantial prizes have been pledged, one being a \$1000 cup donated by Spencer Penrose.

The route from Colorado Springs is by way of the far famed Garden of the Gods to Manitou; thence up historic Ute Pass to Cascade, 12 miles west of Colorado Springs, starting point of the Pikes Peak highway. From here the 18-mile motor trip to the summit has a perpendicular rise of

6694 feet. Miles one and two wind up the forested side of Cascade mountain to Observation point, then along Cascade creek through picturesque scenes to Crystal creek summit and on to its headwaters in miles seven and eight. Glen Cove is reached by skirting the front range, where contact is made with the granite walls of the peak. Timberline is reached just beyond Glen Cove, where the ascent of the mountain's rocky cliff begins.

Up and up in 10 great swings, reaching the crest of the Rampart range in mile 14 at an elevation of 13,000 feet, but so easy has been the rise that one scarcely realizes he has motored to the top of the world. What a magnificent vision greets the eye! South, west and north are 300 miles of giant peaks mantled with eternal snows. Eastward the billowy plain rolls far out into Kansas, while below mile upon mile of the high-



Skirting Front Range, Where Contact Is Made with the Granite Walls of Pikes Peak—This View Presents an Excellent Idea of the Surface of "The World's Highest Auto Highway."

way winds gracefully up through the national forest, whose towering pines, from this altitude, seem but blades of grass.

Down below on the eastward side, Colorado Springs is seen as a checkerboard on the edge of the plain and directly beneath on the west, the great Cripple Creek mining district appears no larger than your car. A tiny lake; a speck of a farm of a mountain town are scattered here and there like dots, in the blackness of the forest.

The course now follows the backbone of the continent on nearly level grades to mile 17, the last pull to the rock-strewn summit, three miles high. Such is the Pikes Peak auto highway, highest and most wonderful of the earth's motor roads. Long will it stand as a monument to the genius and pluck of its builder.

HONOR FIVE MANUFACTURERS.

The National Automobile Chamber of Commerce at its banquet in New York decorated five of its members for special achievement during the year. Large burlesque medals were pinned upon them, but the spirit that underlay the good humor was genuine appreciation for what they had achieved during the year. They were John N. Willys, Dodge Brothers, H. W. Ford of the Saxon Company, and George A. Kissel. Mr. Kissel's recognition came because of the success of the detachable top first used in the Kissel "All-Year" car.

CLIMBED 35-DEGREE GRADE.

Gerald D. Nelson, who made a trip from New York City to San Francisco, going to Grand Canyon and through Arizona in a "22-70" Mercer, de-

clares that in the southwest he went up a 35-degree grade—38.8 per cent.—with five or six inches of sand over it.

A Cole "Eight" had just come down the grade. It was equipped with a gradometer that showed 35 degrees or more. But the Mercer with its four passengers made the pull on low gear. In crossing the continental divide at 9000 feet there was no necessity of adjusting the carburetor differently than it had been at sea level.

BANKERS SUPPORT DEALERS.

The old trouble of the automobile dealer, who found it impossible to get a bank to loan him money in the winter time to enable him to carry a supply of cars for the spring demand, has largely disappeared and now the bankers are glad to loan money on motor cars, according to R. H. Collins, general sales manager of the Buick Motor Company.

Sustained demand for motor cars and the manner in which the business has held up even in periods of general depression has greatly impressed the banking world. Many bankers now consider the security of a dealer who handles a good car as acceptable as farm land.

The new four and six-cylinder Detroit models, which are in preparation, were not completed in time to exhibit at the New York show. However, A. O. Dunk, president of the Detroit company, and several other officials, were at the Hotel Biltmore to show photographs and specifications to interested dealers. The cars will be ready for exhibition at the Chicago show. They were designed by Walter R. Bamford.



Mile Post 10 at Left; Mile Post 11, Near Timberline, at the Right—Note Clear View of Sharp Turn.

CHICAGO SHOW HAS EXHIBITS WORTH \$3,000,000.

Exhibitors Predict the Most Successful Display of the Season—News from the Shows at Buffalo, Detroit, Milwaukee and Fort Wayne.

CAR and accessory exhibitors at Chicago were unanimous in the statement that the first day's attendance at the Coliseum, the Annex, the

CHICAGO SHOW FACTS.

The 16th annual display, held at the Coliseum, the Coliseum Annex, the First Regiment Armory and the Greer building—Open, Jan. 22; close, Jan. 30.

Gasoline Car Exhibitors.....	81
Electric Car Exhibitors.....	7
Accessory Exhibitors.....	183
Gasoline Cars on Display.....	326
Accessories and Parts on Display.....	307
Estimated Value of Exhibits.....	\$3,000,000
Space Covered by Exhibits, Square Feet	94,000
Lowest Priced Car.....	\$395
Highest Priced Car.....	\$7,200
Estimated Attendance from Out of Town	50,000
Exhibitors, Visiting Forces, Officials, Salesmen, Engineers, Mechanics, Etc..	4,000

sion there were 307 exhibits. There were cars at prices that would allow almost any one to buy, the prices ranging from \$395 to \$7200. And there were plenty to buy. It was confidently estimated that the show would draw about 50,000 visitors from outside of Chicago.

On the day of the opening it was announced that there were about 4000 dealers in the city, the large majority of whom had come from such distant points as Texas, the Dakotas and other western states. Altogether the buying brigade of wholesale and retail purchasers attracted from every section of the country will number approximately 15,000.

The Chicago show is considered as the clearing house for the automobile manufacturers, and, considered purely from a business standpoint, it is expected to eclipse any exhibition of its kind in the country, not excepting New York City. Those who have this expectation base their claim upon the fact that Chicago taps a larger territory of actual buyers than does New York, and that the territory embraces the farming communities which recent statistics tend to show absorb more cars pro rata than do the urban centres.

First Regiment Armory and the Greer building, was greater and more enthusiastic than any that they had seen in that city. At the last moment the show management, which consists of the show committee of the National Chamber of Commerce of which Samuel A. Miles is manager, was forced to extend its provisions by the large demand for space and to add the Greer building for show purposes. Thus the use of 94,000 square feet of floor space was made available for the 88 gasoline and electric pleasure car exhibitors and the 183 accessory exhibitors.

Competent authorities estimate that the value of the cars and accessories on display have a total value of about \$3,000,000. Among the exhibitors were practically all those that took part in the New York show, and in addition there were 14 cars that were not shown at Gotham. The new cars referred to are the Halladay, Glide, Detroit, Champion, Elgin, Elcar, Farmack, Gadabout, Princess, Greer, Parry, Signet, Monitor and Walker electric. Among those that were shown at New York, but are not on exhibition at Chicago, are the Herff-Brooks, Kline, Lescina, S. G. V., Sterling-New York and the S. J. R.

There were 326 gasoline cars and seven electric cars on display, while in the accessory divi-

CHICAGO EXHIBITS NOT AT NEW YORK.

Car	Cyl.	Body and Capacity.	Price.
Halladay....	6	Touring—5 passenger....	\$1385
Halladay....	6	Roadster—3 passenger....	1385
Halladay....	6	Con. Coupe—3 passenger..	...
Halladay....	6	Con. Sedan—5 passenger..	...
Glide, 6-40..	6	Touring—5 passenger....	1095
Detroit....	4	Touring—5 passenger....	985
Elgin.....	6	Touring—5 passenger....	845
Elgin.....	6	Roadster—3 passenger....	845
Elcar.....	4	Touring—5 passenger....	795
Elcar.....	4	Roadster—2 passenger....	795
Farmack....	4	Roadster—2 passenger....	855
Farmack....	4	Touring—5 passenger....	855
Farmack....	4	Cabriolet—2 passenger....	1150
Champion...4		Touring—5 passenger....	750
Monitor....4		Touring—5 passenger....	795
Monitor....6		Touring—5 passenger....	895
Monitor....4		Roadster—2 passenger....	795

Not the least of the surprises that awaited the visitors was the scheme of decorations, the theme of which displayed Japanese influence. Each

building has been made to represent a blossoming park in Tokio, and is the work of the artist Tietzel. Quaint Japanese towers, gates and pagodas stand forth in a mass of cherry tree foliage, while overhead a deep blue sky is achieved by the use of a huge painted canvas. The cost of the decorations is said to have been approximately \$50,000.

BUFFALO'S TWO SHOWS.

Motorists in Buffalo, N. Y., and vicinity had opportunity to view the new car models and accessories at two different exhibitions, they both being held in the Broadway auditorium within two weeks of each other. The first, opening Jan. 10, was held under the auspices of the newly formed Buffalo Motor Manufacturers' and Dealers' Corporation; the second was sponsored by the Buffalo Automobile Dealers' Association and was opened to the public Jan. 24.

Fully 5000 people were in attendance on opening night of the first exhibition, which included gasoline and electric pleasure cars, commercial trucks and parts and accessories. One feature of the display was a huge war aeroplane.

When the second show opened Jan. 24 there were 49 pleasure cars, both gasoline and electric, and 10 commercial trucks on display. Among the accessory exhibitors there were 15 that were exclusive features of the second Buffalo show. The management of this exhibition was confident the attendance at its show would be far in excess of that which opened two weeks before.

FORT WAYNE'S CARS WORTH \$100,000.

Attendance records were established at this year's show at Fort Wayne, Ind., the daily average of visitors being well over 1200. Car exhibitors, who were local agents, numbered 30, three of these being electrics and the balance gasoline pleasure car dealers. The valuation of the cars shown was estimated by the management at \$100,000.

MILWAUKEE SHOW WELL ATTENDED.

The attendance at the Milwaukee show was exceptionally large, approaching 50,000 people. The heaviest day of the show was Sunday, when 6414 people, many of them from the smaller cities, visited the exhibits. More prospects were located on this day than in the two days previous, according to the dealers. In the middle west

most shows and amusement enterprises remain open on Sunday, which often shows the largest attendance of the week. About 500 dealers from various parts of the state, who act as sub-dealers for Milwaukee distributors, were in town. Many of them arrived in automobiles, the roads being exceptionally good.

ARGENTINE AUTOMOBILE SHOW.

Argentina's centennial year, 1916, will be elaborately celebrated. It is proposed to have under the auspices of the Argentine Touring Club an automobile week, with races and displays of various kinds of driving. There will be self-propelled boat races and demonstrations of the motor principles applied to agricultural and other industries, as well as exhibits of various sorts of accessories.

In order to help develop the event promoters of similar exhibits in the United States are asked to send copies of all the literature issued by them to American Commercial Attache, Charcas 634, Buenos Aires.

DETROIT SHOWS MANY TRUCKS.

While the Detroit show of 1915 had more cars than the exhibit held this year, the visitors generally expressed their opinion that the display closed on Jan. 22 after a week's run, was more interesting and informative than any of its predecessors. There were 183 cars and chassis on the floor as compared with 205 of last year.

The exhibits were made up of 115 gasoline pleasure cars and 16 chassis; 30 gasoline commercial vehicles and 12 chassis, and 10 electric passenger cars. Last year there were 25 electrics, which disparity accounts for the falling off in the total number of displays. There was a goodly number of accessory and parts exhibitors, a few of whom were new to Detroit.

Through typographical error there appeared in the Dec. 25 issue of The Automobile Journal, on page 23, the statement that the price of the Maxwell 1916 touring car is \$615. That statement is incorrect; the price should have been given as \$655. The prices of complete Maxwell line for 1916 is given as follows: Five-passenger touring car, \$655; two-passenger roadster, \$635; two-passenger cabriolet, \$865; six-passenger town car, \$915; five-passenger permanent top convertible body, \$935. All prices are f. o. b. Detroit.

GENERAL NEWS OF THE INDUSTRY.

Willys Issues Statement of Financial Condition of Company—Chevrolet of St. Louis Capitalization Raised to \$1,000,000—Personal News.

HOLDERS of preferred and common stock of the Willys-Overland Company have been advised through a circular signed by John N. Willys, president, that earnings for the year ending Dec. 31, 1915, were \$10,000,000. This amount, which is partly estimated, is more than 9½ times the preferred dividend requirements on the new \$15,000,000 issue, and equal to 45 per cent. on the common stock. The average surplus for the 3¼ years ending Sept. 30, 1915, was \$6,893,622, which is equivalent to 6½ times the annual dividends on the new preferred stock.

The proceeds of the new issue will be applied to retiring existing \$4,483,700 preferred stock, and to the general funds of the company.

The circular points out that the total net assets of the company as of Sept. 30, 1915, exclusive of good will, patents and trade marks, plus the net proceeds of the new preferred stock issue, were over \$35,000,000. The net current assets were about \$22,000,000.

The growth of the Willys-Overland Company since its control was taken by the present management in 1907 is shown by the statement that in the first year the company sold 323 cars, and that for 1916 there is scheduled for production approximately 200,000. The company sold 21,000 cars in 1912, 37,000 in 1913, 48,000 in 1914, and 95,000 in 1915.

Since the formation of the present company in November, 1912, dividends on the common stock have been as follows: 1913, six per cent. cash and five per cent. cash extra; 1914, six per cent. cash; 1915, six per cent. cash and five per cent. stock extra.

The new seven per cent. convertible preferred stock is exchangeable from Jan. 1, 1917, to Jan. 1, 1922, into common stock at 300. In the event that additional common stock is issued as a dividend or at prices less than \$300 per share, the conversion price is to be proportionately reduced. The company is to set aside, on or before July 1 of each year, commencing in 1917, a sum equal to three per cent. of the par value of the preferred stock as a sinking fund.

At the Overland plant at Toledo 13,600 employees are engaged, while the forces at work in the plants at Elmira, N. Y., and Elyria, O., bring the total of Overland employees up to 19,200. The Toledo plant now occupies 108 acres. Since 1912 the number of Overland dealers has increased from 1843 to 4000 in 1916.

About a week after the issuance of the circular referred to above, the stockholders of the company met at a special meeting and formally authorized the increase of the company's common stock from \$25,000,000 to \$50,000,000, and voted to authorize a new preferred stock issue of \$25,000,000.

This action formally approved the proposal to increase the authorized total stock of the company to \$75,000,000, and to issue the convertible seven per cent. preferred stock, which has been offered to common stock to the extent of 71½ per cent. of holdings at 110, and through the courtesy of Mr. Willys to the holders

of the old preferred stock on similar terms. The old issue of preferred has been called for redemption at 110.

Immediately after this action the company declared the regular quarterly dividends of 1½ per cent. on the common stock, payable Feb. 1 to stock of record Jan. 22.

VOTING TRUST FOR ENTZ PATENTS.

A voting trust, which will endure for five years, has been created in connection with the Entz Motor Patent Corporation, which controls the Entz electric transmission patents, a large share of which were recently taken over by the General Electric Company from R. M. Owen & Co. The power of voting the stock of the corporation is placed with the following: R. M. Owen, president; R. A. Rainey, vice president; D. C. Durland of the Sprague Electric Company, which is one of the General Electric group; George F. Morrison of the Edison Lamp Works, which is another of the General Electric properties; R. H. Montgomery and Richard Swartout, representing financial interests.

ST. LOUIS CHEVROLET INCREASE.

According to a statement filed with the secretary of state of Missouri the capital stock of the Chevrolet Motor Company of St. Louis has been increased from \$10,000 to \$1,000,000. In connection with this is the statement that the Banner Buggy Company has reduced its capital from \$700,000 to \$400,000. Russell E. Gardner is president of both companies.

OGREN CHANGES NAME AND EXPANDS.

The name of the Ogren Motor Car Company has been changed to the Ogren Motor Works, Inc., and the capital stock has been increased from \$25,000 to \$1,000,000. The new company is incorporated under the laws of Delaware. H. W. Ogren, designer of the car, is chief engineer and general manager. The company will erect a new plant at a cost of about \$150,000 at Waukegan, Ill.

BULL IS CHAIRMAN OF DIRECTORS.

F. K. Bull, for many years president of the J. I. Case Threshing Machine Company, has been advanced to the newly created position of chairman of the board of directors. W. J. Davis, treasurer, was elected to the presidency and will continue as treasurer. The list of directors and officers now reads as follows: F. K. Bull, chairman of the directorate; W. J. Davis, president and treasurer; E. J. Gittins and M. H. Pettit, vice presidents; W. F. Sawyer, secretary; Stephen Bull, assistant secretary; C. J. Farney and R. P. Howell, assistant treasurer; directors, Frederick Robinson, W. E. Black, F. L. Hine, A. O. Choate and the officers.

PULLMAN HAS NEW HEAD.

Following the departure of John C. Schmidt as president of the Pullman Motor Car Company, York, Penn., C. L. Hoff, general manager of the Standard Chain Company of the same city, was appointed to the office. Mr. Schmidt was also president of the Standard company.

The Pullman company is planning for an exceptional year. The factory is now being operated to full capacity and recently additions to the value of \$100,000 have been made. The 600 men constituting the working force are working day and night.

WILL INCREASE SIGNAL CAPITAL.

Arrangements are being completed to increase the capitalization of the Signal Motor Truck Company, Detroit, from \$85,000 to \$450,000. Of the total amount \$300,000 will be common stock and \$150,000 will be seven per



H. H. Radford, Former General Manager of the Cartecar Company.

cent. accumulative preferred. For the protection of preferred stockholders it will be provided that no dividends will be paid on the common. This will reduce the net current assets to a total of 125 per cent. less than the amount of preferred outstanding. Furthermore, an amount in cash equal to each dividend on the common will be carried to a reserve for the retirement of the preferred.

The company will be incorporated under the laws of Maine and will be known as the Signal Motor Truck Company of Maine. It will take over the assets and business of the Signal Motor Truck Company of Michigan, and application for listing on the Detroit stock exchange will be made.

AJAX RUBBER DECLARES DIVIDEND.

The Ajax Rubber Company, which was formed recently to take over the business, assets and good will of the Ajax-Grieb Rubber Company, has declared a quarterly dividend of \$1.25 a share, placing the stock on a 10 per cent. basis, or \$5 a share annually. Net earnings of the Ajax-Grieb company for the last four fiscal years ending Aug. 31, 1915, averaged \$432,445 annually, which is equivalent to more than 14 per cent. of the par value of the \$3,000,000 stock of the new Ajax company.

President William Grieb has advised the stockholders that the company has closed contracts in excess of \$3,000,000 of its output, and he estimated earnings for the fiscal year to end Aug. 31, 1916, available for dividends, of \$750,000, which is equal to \$12.50 a share.

INTERNATIONAL MOTOR PROFITS.

Profits of the International Motor Company in the fiscal year ended Dec. 31, 1915, amounted to approximately \$750,000. This is equivalent to about 21 per cent. on the \$3,600,000 seven per cent. cumulative preferred stock, on which no dividends have been paid since 1912.

PREMIER DIRECTORS ARE CHOSEN.

The directorate of the Premier Automobile Company, Indianapolis, has been chosen by the stockholders. The following were elected:

C. F. Jensen, H. L. Thompson, E. W. Steinhart, J. C. Flowers, F. W. Woodruff, Theodore Gerlach and G. E. Woodruff. The directors appointed the following as officers: J. C. Flowers, president; E. W. Steinhart, vice president; C. F. Jensen, secretary; H. L. Thompson, treasurer.

NEW SIX AT \$900.

Chief among those interested in the organization of a new manufacturing concern to produce a six-cylinder car for \$900 are: J. G. Beyerline and W. L. Daly, who respectively were president and general manager and advertising and sales manager of the King Motor Car Company. The selling and manufacturing organization is now nearly completed and definite announcements are expected at an early date.

SPRINGFIELD BODY OFFERS STOCK.

The Springfield Body Corporation, Springfield, Mass., which recently took over the old Springfield Metal Body Company, has offered \$750,000 eight per cent. cumulative and participating preferred stock at par through New York City brokers. This is the first offering of the new \$1,000,000 issue recently authorized. It is redeemable at 200 at the option of the company after Jan. 1, 1917. The funds are to be used for enlargement of the Springfield plant and for construction of a new plant at Detroit.

BARTHEL JOINS KING MOTOR.

Following the resignation of F. A. Vollbrecht from the King Motor Car Company, Detroit, the company advises that Theodore E. A. Barthel was elected as vice president and general manager at the annual meeting of the directors in New York City. Mr. Vollbrecht's plans have not yet been announced.

Mr. Barthel has been identified with the automobile industry for a long time. He was connected with the Olds Motor Works for seven years, and is credited with constructing a car as early as in 1902. Since then he has been in close touch with many of the large manufacturers. During the past three years he was associated with the Motor and Accessory Association of New York City.

SOWARD IS JEFFERY SALES MANAGER.

Announcement is made by the Thomas B. Jeffery Company, Kenosha, Wis., that hereafter the sales of pleasure cars will be handled by E. G. Soward, newly appointed sales manager, and by W. B. Riley, assistant sales manager. H. C. Hart will have charge of the truck sales, while the foreign department will be conducted by J. A. Rose.

DURIE CHASE PRODUCTION MANAGER.

Beginning Feb. 1, Charles A. Durie will assume the duties of production manager of the Chase Motor Truck Company, Syracuse, N. Y. He has been with the Chase company for four years and now is in charge of the final assembly department.

BAILEY-HEMINGTON REORGANIZES.

R. B. Lawrence and Charles Oswald have secured control of the Bailey-Hemington Company, advertising specialists of Cleveland, O., and have reorganized the concern. New capital, new blood and a new policy have been introduced.

Mr. Lawrence, the president, was formerly with the Morse International Agency. He has been advertising manager of the Higbee company, Cleveland, and of the D. J. Healy Company, Detroit, and was general manager in charge of sales and advertising of the Lewis Manufacturing Company.

Mr. Oswald, secretary and treasurer, was for five years advertising manager of the Joseph & Freiss Company, makers of Clothcraft clothes, and since then has been conducting a service agency, specializing in dealer co-operation and service problems.

JORDAN HEADS NEW COMPANY.

E. S. Jordan, formerly secretary and general sales manager of the Thomas B. Jeffery Company, Kenosha, Wis., has resigned to take the presidency of a new company that is soon to place a new high-grade car on the market. With him are Paul Zens, Jeffery purchasing agent, and R. S. Begg, experimental engineer of the same company. It is related that the new car will be assembled from first quality parts and that the body design will exhibit several new ideas.

THREE STUDEBAKER MEN PROMOTED.

The Studebaker Corporation announces the following changes in its organization, the changes being in the nature of promotions:

W. S. Williams, formerly manager of the Dallas branch, has been appointed to the management of the larger branch at Kansas City. Previous to going to the

Texas location, Mr. Williams had been retail sales manager of L. Markle Company, Studebaker dealer in Chicago.

L. B. Alford, assistant branch manager at Dallas, takes Mr. Williams' position there, and Mr. Alford is succeeded by W. D. Lacey, who is advanced from whole-sale salesman.

RADFORD COMING BACK.

H. H. Radford, who was one time vice president and general manager of the Cartercar Company, and who retired some time ago to recover his health, which had suffered from business strain, is understood to be contemplating again entering the automobile industry.

PROMOTIONS IN FIRESTONE COMPANY.

E. W. BeSaw, formerly Des Moines branch manager for the Firestone Tire and Rubber Company, has been given charge of all the western branches of the company.

Dan C. Swander, who had charge of the Firestone



Firestone Promotes Three Men—Left to Right: E. W. BeSaw, in Charge of Western Branches; Dan C. Swander, in Charge of Eastern District; N. B. Burwell, Who Has Charge of the Southern Territory.

branch at New York City, has been appointed eastern district manager. He is succeeded at New York by C. D. Studebaker.

The southern district has been placed in charge of N. B. Burwell of the home office of the Firestone company at Akron.

EDISON'S NEW ADVERTISING MANAGER.

Paul Sutcliffe has been appointed advertising manager of the Edison Storage Battery Company, Orange, N. J. Mr. Sutcliffe gained his knowledge of advertising in California. Coming east in 1912 he joined the Edison interests, but resigned at the end of a year to become secretary of the W. S. Hill advertising agency in Pittsburgh. He has been in the Edison advertising department for the past year.

Alfred O. Dunk, president of the Detroit Motor Car Company, Detroit, announces the appointment of D. H. Torrey to the position of assistant sales manager of the company, the appointment to become effective at once.

RHODE ISLAND'S NEW MOTOR CAR CODE.

A COMPLETE new motor vehicle act, repealing all provisions of the prevailing code that conflict with it, will be placed before the present session of the Legislature.

Innovations begin with the definition of terms. "Motorcycle" includes only motor vehicles that operate on two wheels, or bicycles propelled by an auxiliary wheel. The motorcycle with side car is declared to be an automobile and requires the same fee as a light car up to 15 horsepower, namely, \$5.

Another provision is that each vehicle instead of being registered for a year from the date on which registration is taken out, is to be registered only until midnight Dec. 31, when all registrations will run out at the same time. As the 1916 licenses now being issued run into 1917, this phase of the act cannot be put in force until 1918.

If a license is revoked, or a car sold to another person, the license issued by the state must be returned, and in case of a sale the name and address of the buyer must be filed with the state authorities.

If an owner sells his car or loses it through theft and desires to register another, he may do so by paying \$1, providing the fee required for the new car is the same or less than that for the old one. If it is more he must pay the difference.

A new schedule of fees is included in the bill: For automobiles up to 15 horsepower the cost is \$5; from 15 to 30 horsepower, \$10; 30 to 40 horsepower, \$15; more than 40 horsepower, \$25. Under the present law the \$5 fee covers cars to 20 horsepower and \$20 is the highest fee. If the new rate is adopted considerably more money will be collected by the state.

Even more radical increases are made for the registration of motor trucks. The present law requires a fee of \$7 for all trucks. That amount now secures registration only for a car of one ton or less; for a two-ton truck the amount is \$10; three tons, \$13; four tons, \$16; for every ton thereafter up to 10 tons, \$4 is added.

The motorcycle fee is \$2 and a dealer's license is \$25, which permits the use of five cars. If more are used additional payment of \$5 per car must be made. The motorcycle dealers' fee is \$10. Ambulances owned by hospitals and cities, and state owned machines, need not be registered.

An exemption of 10 days is granted to non-

resident owners who have complied with all the requirements of their own state laws.

The section relating to operation forbids racing or attempts to set new speed records or fast operation on bets or wagers. Use of muffler cut-outs is forbidden in built up sections, except on ambulances and fire and police vehicles. The law includes a section defining in detail the rules of the road.

The use of anti-skid chains on gravel roads is forbidden unless it is "reasonably" necessary for safety. The law provides that no motor vehicle can be left standing without being locked. This section is especially interesting in view of the large number of stolen cars and the efforts of the insurance companies to encourage their customers to use locks.

It is required that the courts shall keep a record of every case involving breach of the law and shall transmit such record to the board inside of 10 days.

The control of motor car traffic by cities and towns is restricted to closing certain thoroughfares. They may not enact ordinances regulating speed. The board is authorized to employ investigators and examiners at compensation and for terms of service set by itself.

It is provided that if any person is killed in a motor car accident the license of the driver of the vehicle shall be automatically suspended and unless subsequent investigation proves that the driver was in no way to blame the license must be revoked by the board. In the course of its investigations the board is empowered to administer oaths, summon witnesses and require the production of records.

The first breach of the law makes an owner liable to a \$200 fine and 30 days in jail; the second, to \$500 fine and 60 days in jail; and the third, imprisonment for 90 days without alternative and the revocation of the license, which may not be renewed for two years.

Any owner arrested for violating the law can tender his car as bail. Previous motor regulations and all other acts inconsistent with the new law are repealed.

If the law is passed it will be before May, when the Legislature adjourns. There is likely to be a fight on some of the provisions, notably those raising the amount of fees, and some amendments to the act as introduced are likely to be made.

SUGGESTIONS FOR THE FORD CAR OWNER.

Beginning the Overhaul of Chassis with the Facilities Available in the Small Garage Describing the Work of Dismantling the Power Plant.

The 40th article dealing with the operation, construction, maintenance, care and repair of the model T Ford chassis is the first of a series that will deal with adjustment, restoration and overhauling, in which every probable condition will be considered.

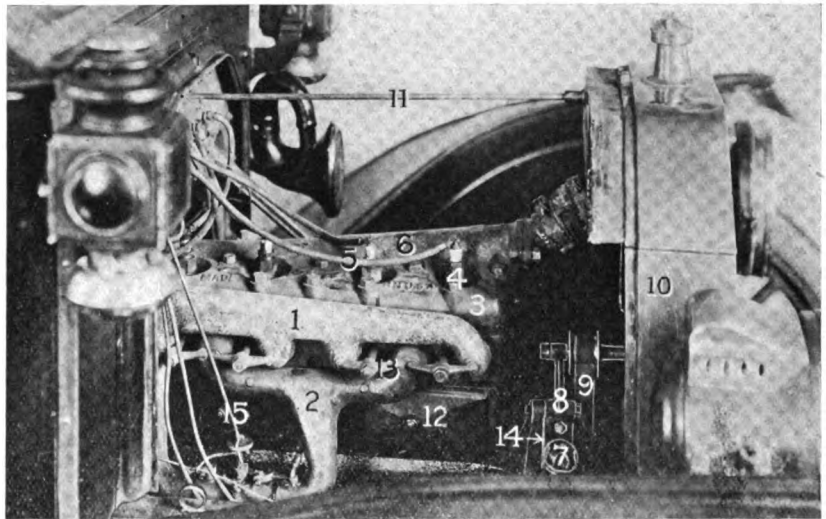
WHEN a car is delivered the owner receives it in a normal operating condition, but it will require from 500 to 750 miles driving to fully "limber it." At that stage the machine ought to be at its highest efficiency. No matter how careful or thorough the lubrication or the attention the chassis will wear. Much of this wear can be compensated by adjustments. No two machines will wear alike, and the driver will learn from experience the degree and character of care that will be most productive of results from his point of view.

That normal efficiency is desired is assumed, and the descriptions and illustrations of a complete overhaul will deal with whatever will result from wear or neglect, or from careful use for a considerable period of time. The work is systematically described and followed. There are adjustments and other work that will be necessary oftener than overhauls, such as cleaning the cylinders, pistons and combustion head, grinding the valves, cleaning and greasing wheel bearings, adjusting brakes, adjusting steering linkage, etc., all of which can be done in the manner in which the more thorough restoration is accomplished.

The work is not undertaken with such facilities that would be found in the repair shop or service station, and the tools are such as the owner might have or can obtain at minimum expense. Where special tools would be advantageous, these are described. In overhauling, unless the body is to be painted and refinished, its removal from the chassis is not imperative. The work could be done easier and quicker were the body removed, but this is not always practical

because of limited space and the need of additional help to handle it. Neither is there necessity of taking out the entire power plant, for every essential work can be done by removing the cylinder block and the transmission gearset, leaving the lower section of the engine case attached to the chassis frame. Two men can handle the cylinder block, but three are necessary to remove and replace the complete engine.

The head lamps, dash lamps, front fenders and the steering gear are not taken out because of the desire to save time and expense. There is no reason why these cannot be removed if the owner wishes to make a more thorough job, but as the



The Engine of the Car Before the Overhaul Was Begun, Showing the External Equipment.

- | | | |
|--------------------------|------------------------|-------------------------|
| 1—Exhaust Manifold. | 7—Breather and Filler. | Plates. |
| 2—Intake Manifold. | 8—Fan Bracket. | 13—Exhaust and Intake |
| 3—Cylinder Block Head. | 9—Fan Belt. | Manifold Stirrups. |
| 4—Spark Plugs. | 10—Radiator. | 14—Timing Gear Case. |
| 5—Secondary Wiring. | 11—Radiator Brace Rod. | 15—Carburetor Adjusting |
| 6—Water Outlet Manifold. | 12—Valve Chamber Cover | Rod. |

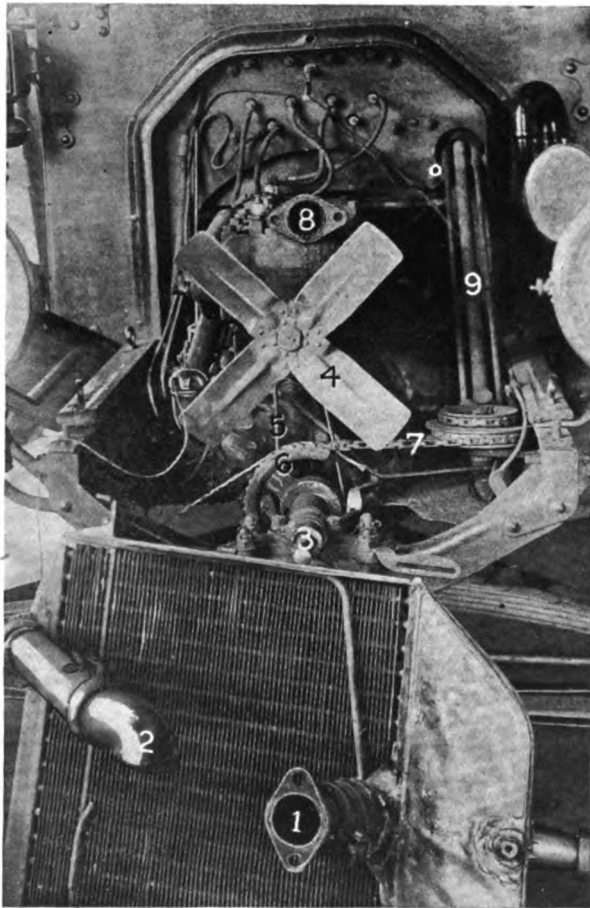
steering gear is the only mechanical assembly, and this requires attention at much longer intervals than the remainder of the chassis, this will be dealt with without disassembling.

Insuring Identity of Parts.

The owner is assumed to know that parts that are interchangeable, or may be confused, shall be plainly marked so they can be replaced as origin-

ally assembled; that bolts, nuts, washers and the like, should be put together after taking out, and that when there is uncertainty as to identity of any particular part or parts, written notes and rough sketches should be made as guides to correct assembly. A series of boxes for the parts removed, each marked plainly, will be a distinct help. Care in this respect will save time and trouble.

The accompanying illustrations are typical of



The Engine with the Radiator Removed.

- 1—Radiator Inlet Manifold. 6—Engine Starter Sector.
 2—Radiator Outlet Manifold. 7—Engine Starter Chain.
 3—Crankshaft Extension. 8—Water Jacket Outlet.
 4—Fan. 9—Steering Column.
 5—Fan Belt.

the conditions that will be met by the owner. The machine may appear from the photographs to have been neglected, but this is far from being a fact. The chassis was built in 1914 and it had been driven for two seasons. It was reasonably cared for, but it was sufficiently in need of attention to justify an overhaul.

Beginning the Work on Engine.

The chassis was driven into the garage from

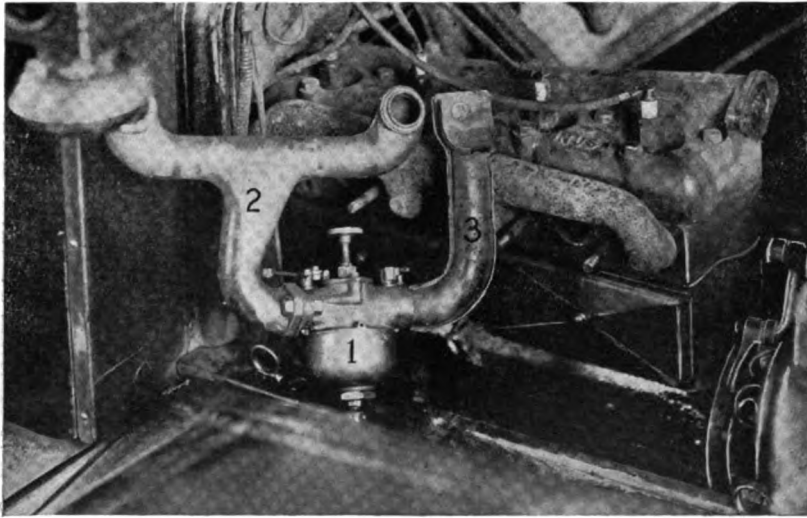
the street and the water was drained from the radiator into a large pan placed beneath the drain cock in the base of the radiator. Next the bonnet or hood was lifted off. The radiator brace rod, which extends from the radiator to the dash, was removed by loosening the check nut on the rear end of the rod that is seated against the outside of the dash, and turning the rod to unscrew it from the tapped lug that is soldered on to the rear of the tank or header of the radiator. When the check nut is loosened the rod can be backed out of the lug. The nut should not be removed from the rod.

Removing the Radiator.

The radiator is supported by a bracket at either side that is bolted to the side members of the chassis frame, and by the inlet and outlet manifolds. The inlet manifold is located in the centre of the base of the header tank of the radiator, and the outlet manifold is offset at an angle from the left side of the rear of the bottom tank or base of the radiator. The inlet manifold is connected with a section of large rubber hose with a fitting that carries a flange that is bolted to the outlet of the water jacket, at the forward end of the cylinder head. The outlet manifold is bolted to the intake of the water jacket at the left side of the cylinder block, near the base of the water jacket. Two bolts secure the flanges of the fitting at outlet of cylinder head, and two studs secure the flange of the outlet manifold to the intake of the cylinder block. When the nuts on these two studs and the two bolts that secure the water connections, and the two bolts that hold the two side brackets are taken off the bolts can be removed and the radiator can be lifted from the chassis. The nuts are easy to reach and the work is a matter of a very few minutes. The illustration shows the radiator placed against the front of the chassis, so that the location of the water connections can be plainly seen. After the radiator is removed it ought to be placed where it cannot be damaged by accident.

Taking Off the Fuel Manifold.

The next work is to remove the nuts from the four studs that retain the stirrups or clamps by which the intake manifold and the exhaust manifold are held. One will note that the stirrups are so placed that they bear in pairs on the ends of the intake manifold, and bear singly at regular intervals on the exhaust manifold, in every instance being centred directly above the intake and exhaust ports of the cylinder block so as to insure equal pressure upon the gaskets when the stirrups are tightened. The gasoline supply is then shut off. In the illustration the



The Engine with the Manifold Stirrups and the Intake Manifold and Carburetor Removed.

1—Carburetor.

2—Fuel Intake Manifold. 3—Hot Air Pipe or Stove.

intake manifold has been removed and lifted and turned around, showing the carburetor above the chassis frame, as well as the hot air pipe or stove, which extends from the air inlet of the carburetor to the exhaust manifold. To remove the carburetor the carburetor adjusting rod, which projects downward from the rear of and through the dash, is lifted. At the lower end of the rod is a fork, the ends of which are fitted into holes in the top of the movable disc on the carburetor, by which the fuel supply is governed by turning.

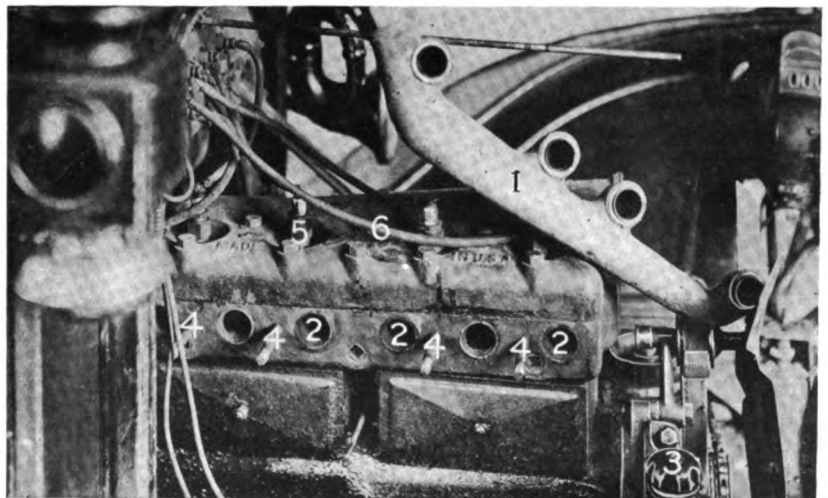
With the intake manifold removed the exhaust manifold is loose, and this can be drawn out from under the dash, with the exhaust pipe. The rear end of the exhaust pipe projects into the muffler. If one desires the exhaust manifold can be disconnected from the exhaust pipe by loosening the brass packing nut that connects the two, but the same results can be obtained by drawing the exhaust pipe out of the muffler, unless one has some reason for disconnecting the manifold and leaving the pipe. In the illustration the manifold is shown against the engine block, the packing nut being just above the radiator brace rods, which extends forward from the dash.

Next the spark plugs are taken out of the cylinder head.

has been described and the wrench used on the screws.

Disconnecting the Primary Wiring.

At the forward end of the right side of the engine, just ahead of the cylinder block and outside of the timing gear case is the breather and oil filler. Through this the oil is poured into the base of the engine case. Inside of the breather and on top of the timing gear case the shaft of the fan bracket is mounted in a round recess in the gear case, which shaft can be clamped by tightening a bolt that is seated in the case at right angles to the shaft. In the centre of the timing



The Engine with the Exhaust Manifold and Exhaust Pipe Removed.

1—Exhaust Manifold.

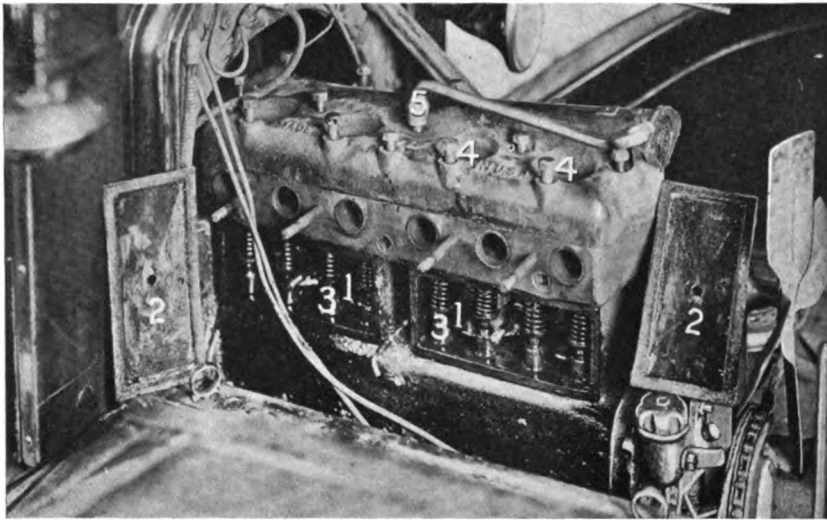
2—Exhaust Ports.

3—Breather and Filler.

4—Manifold Stirrup Studs.

5—Spark Plugs.

6—Secondary Wiring.



The Engine with Valve Chamber Plates Removed and Cylinder Head Cap Screws Loosened.

1—Valve Chambers.
2—Valve Chamber Covers.
3—Valve Springs.

4—Cylinder Head Cap Screws.
5—Socket Wrench.

gear case, on the end of the shaft, the timer is mounted, and the cover is retained by a tongue clamp that is attached to the breather. By loosening the clamping bolt the shaft of the fan bracket can be released and taken out, and the cover can be removed from the timer with the wires attached, this obviating the need for the time being of disconnecting the primary wires from the timer cover. In the illustration the fan and bracket have been removed from the timing gear case, and the cover has been taken from the timer. This chassis was fitted with an engine starter, the chain and sector mounted on the shaft being shown in the illustration.

The work that has been described is preparatory to removing the engine from the chassis, but before this can be done all of the connections must be cleared, and as the cylinder head of the engine block must be taken off, this can as easily be done before the engine is ready to take out. The purpose is to have the engine free of all parts that can be consistently taken off, as it can be the easier handled, and there will be no probability of any of these being damaged by being brought into contact with a bench.

By reviewing the work done

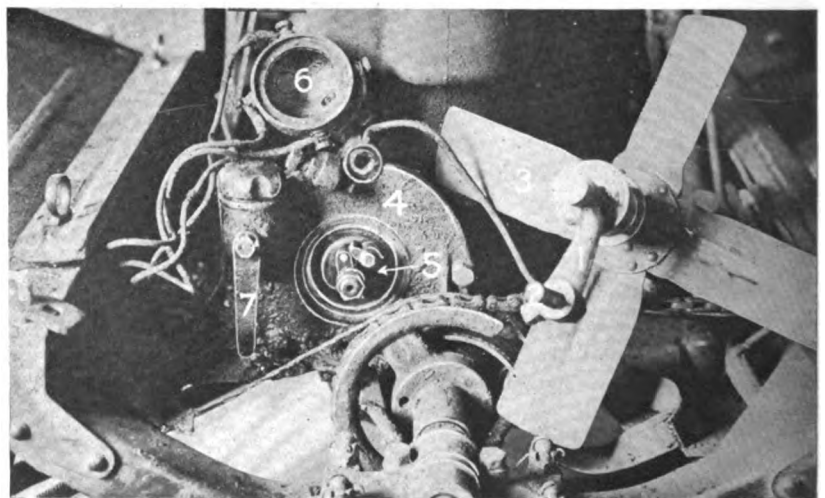
one will understand that the radiator must be disconnected if there is cleaning or repairing of the radiator in prospect. The same series of operations is necessary if one is to remove the cylinder block head for the purpose of cleaning the combustion chambers, grinding the valves, removing carbon deposits from the pistons, or to replace the gasket.

The radiator must be drained and manifolds disconnected and the cap screws that retain the cylinder block head must be loosened, and the manner in which the work is done is in reverse of the reassembling, although there are times when the order may be changed somewhat that there shall be

greater convenience for the worker.

The ignition wiring is disconnected by removing the cable terminals from the binding posts of the spark plugs, and the primary cables are not even removed from the cover of the timer, because for the work on the engine that has been stated there is no reason to do unnecessary labor. To the expert mechanic the replacement of the cables would be a matter of two or three minutes, perhaps, but the less experienced workman might have considerable trouble.

(To Be Continued.)

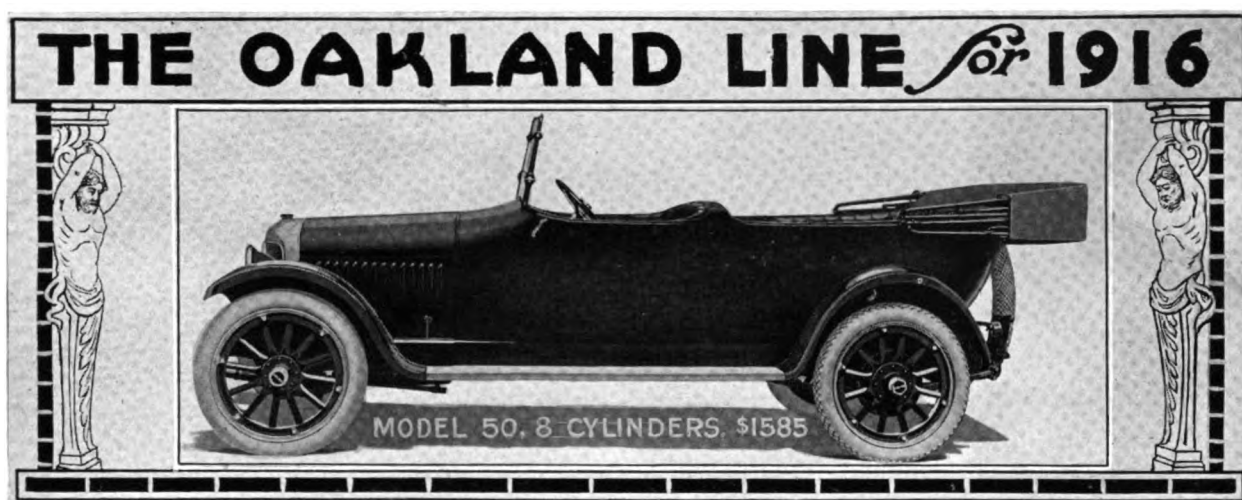


The Engine with the Fan Bracket and the Timer Cover Removed.

1—Fan Bracket.
2—Fan Bracket Shaft.

3—Fan.
4—Timing Gear Case.
5—Timer.

6—Timer Cover.
7—Timer Cover Clamp.



FOR 1916 the Oakland Motor Car Company, Pontiac, Mich., plans production of four, six and eight-cylinder chassis, the last named model being the one announced just prior to the New York show. It attracted wide attention there because of its high speed engine with counterbalanced crankshaft, aluminum pistons and its aluminum draft inducer, which resembles a small steamboat funnel and provides plenty of air to the carburetor.

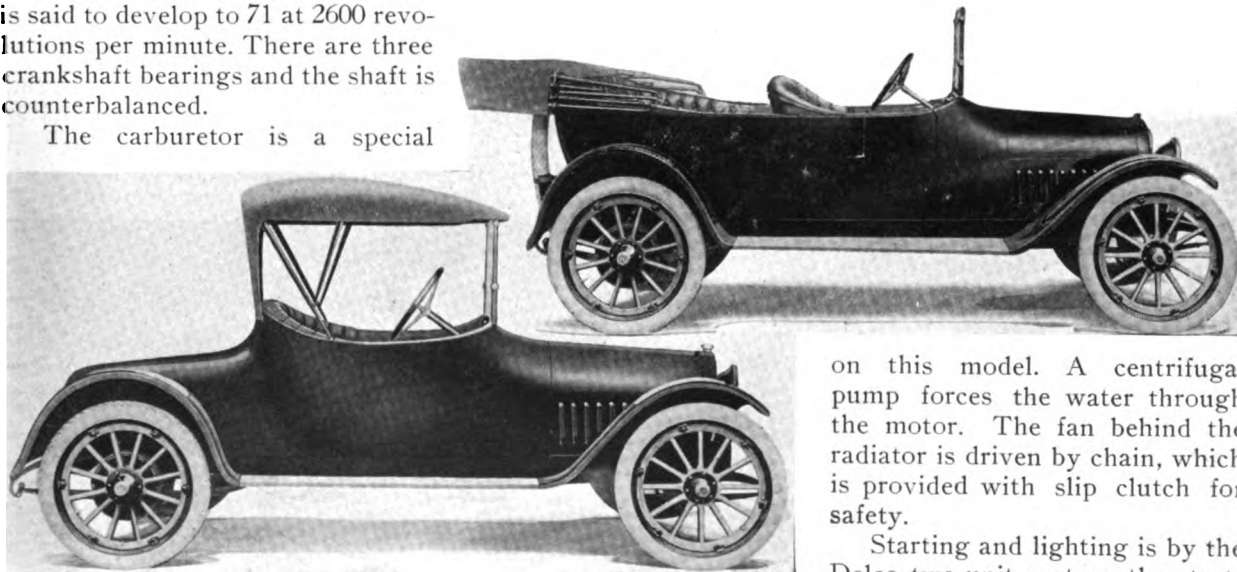
The power plant is a unit, supported at three points, and includes engine and transmission. The motor is of the V type, and the cylinders are cast in two sets of four each. The cylinder heads are readily detachable. The horsepower, according to A. L. A. M. rating, is 39.22, but on brake tests is said to develop to 71 at 2600 revolutions per minute. There are three crankshaft bearings and the shaft is counterbalanced.

The carburetor is a special

Stromberg, with a hot air pipe to the primary air intake. The needle adjustment and primer are operated from the dash. Lubrication is by force feed, the oil from the sump being drawn through a screen and forced to the main bearings, whence it passes through holes drilled in the crankshaft to the connecting rod bearings. An oil level indicator is at the side of the crank case and an oil pressure gauge on the dash.

Delco ignition is used, the system being independent of the starting and lighting apparatus. Automatic spark advance is employed. The coil and timer are located at the front between the two cylinder blocks.

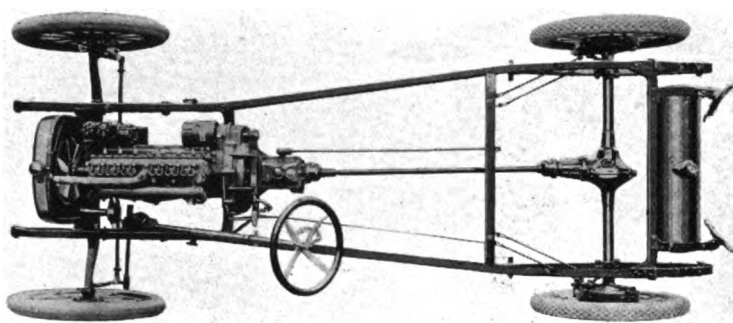
The Oakland German silver pointed, or V shaped, radiator of cellular construction is used



The Oakland Six-Cylinder Car, Model 32—Top, the Touring Car with Capacity for Five Passengers; Bottom, the Two-Passenger Roadster—Both These Cars Are Priced at \$795 Each and Are Supplied with Complete Equipment.

on this model. A centrifugal pump forces the water through the motor. The fan behind the radiator is driven by chain, which is provided with slip clutch for safety.

Starting and lighting is by the Delco two-unit system, the starting motor driving to the flywheel by Bendix drive. An Exide storage battery is carried.



The Stripped Chassis of the Oakland Model 32, the Six-Cylinder Car.

The cone type of clutch is used, and it is very light to facilitate gear changing. It is provided with a clutch brake. The transmission is of the three-speed selective type and is entirely mounted on ball bearings. Its gears are made of high carbon, chrome nickel steel.

The rear axle is of a one-bearing, full-floating type. The drive gears are of spiral bevel type. The differential unit is easily reached by removing the cover plate at the back of the axle housing, which is of very strong steel construction. There are two universal joints in the propeller shaft, which is tubular.

There are two sets of brakes, both mounted on the rear axle, the service set being external contracting on a 14-inch drum, and the emergency brake being internal expanding.

Front springs are semi-elliptic and the rear set, three-quarter elliptic and underslung. Artillery type wheels carry 34 by 4½-inch tires and have Baker demountable rims. An extra rim is included in the equipment. Non-skid tires are used on the rear.

The steel body on wood frame work is of the streamline design with centre cowl. Auxiliary seats of the disappearing type are placed in the

tonneau. Upholstery includes genuine curled hair and leather, together with high-grade coiled springs. The body finish is a rich coach green.

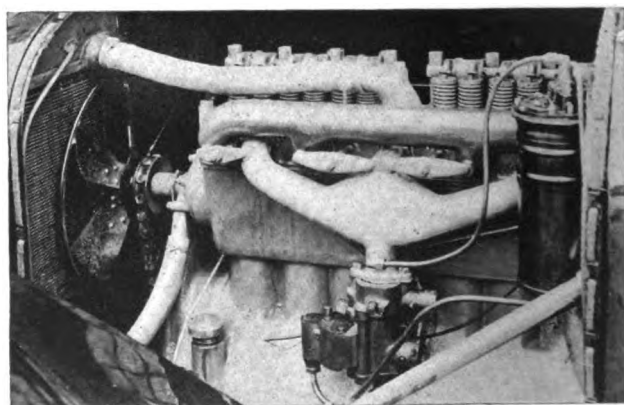
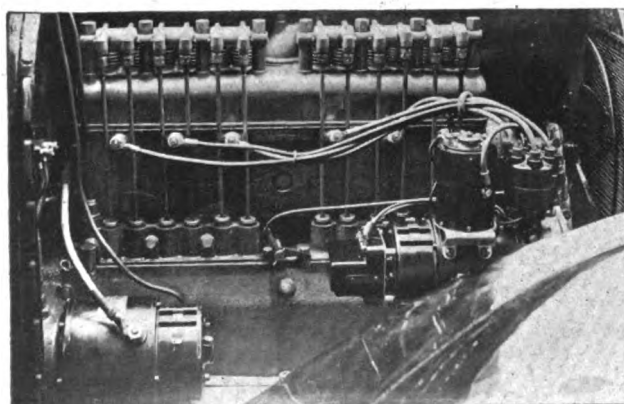
The instrument board carries the Delco combination switch, an ammeter, an oil gauge and speedometer and the carburetor control. Standard equipment includes all necessary tools, a top boot, a power driven tire pump, side curtains, etc. The windshield is of the ventilating type and the glasses over-

lap at the joint to keep out rain. The electric headlights are provided with dimmers. The gasoline tank, which is located in the rear, has capacity for 18 gallons.

Wheelbase is 127 inches. A distinctive feature is that the skirt shield or apron between the frame and the running board has been eliminated by having the frame deep to meet the running board brackets, which gives a wide board and a graceful appearance.

The other two chassis completing the Oakland line are a six-cylinder (model 32) and a four-cylinder (model 38). This last named was described in detail in the May 25 issue of The Automobile Journal.

The model 32 has an Oakland-Northway block motor, six-cylinder, valve in head type and credited with 30-35 horsepower. The power plant is in unit and has three-point suspension. The bore of the motor is 2 13/16 inches and the stroke 4¾ inches. The cylinder head is quickly removed without disassembling the rocker arms or push rods, and the valves can be reground with minimum trouble. Electric starting, lighting and ignition is by a Remy two-unit system. The generator is located at the right side of the motor

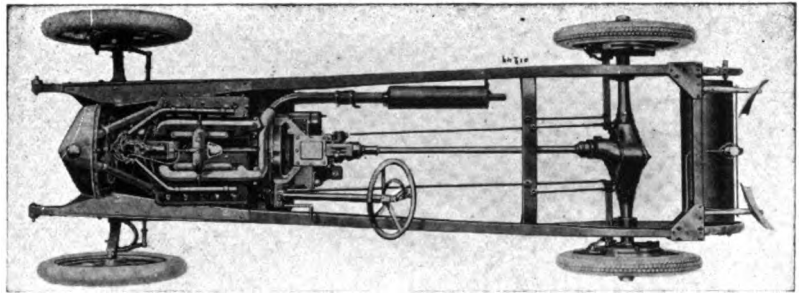


Views of Both Sides of the Oakland Model 32's Northway Block Motor, Which Is Credited with 30-35 Horsepower.

and is driven by a gear from the camshaft. The Marvel one-inch carburetor is used and is located close to the Y of the manifold.

Lubrication is by splash system; a plunger pump located in the crankcase forces the oil through a sight feed in the dash and back onto the crankshaft bearings. Bearings used throughout are New Departure and Hyatt high duty bearings. Cooling is by a centrifugal water pump carried on the fan shaft and driven by a V belt from the camshaft.

The clutch is of the cone type with a ball bearing release shoe. The three-speed selective type of transmission is used. The drive is the Hotchkiss, with tubular propeller shaft and double universal joints. The rear axle is a one-bearing, full floating type.



The Chassis of the Eight-Cylinder Oakland Model 50.

lon gasoline tank is swung well under the car at the rear.

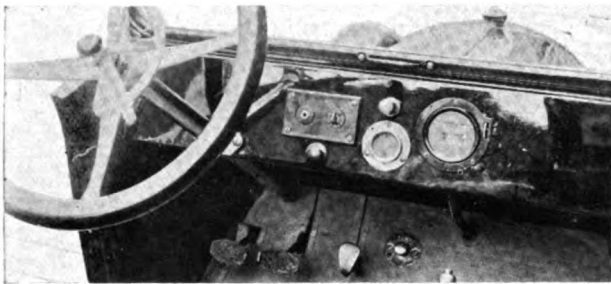
The three Oakland models are supplied with a seven-passenger touring body for the eight-cylinder chassis at \$1585; a five-passenger touring and a two-passenger, six-cylinder roadster at \$795 each, and a five-passenger touring, a two-passenger roadster, a two-passenger speedster on the four-cylinder chassis at \$1050.

OFFER 12 FOR OLDEST HAYNES.

The offer of an even trade of a new 12-cylinder Haynes for the oldest Haynes car to be found in America is made by the Haynes Automobile Company of Kokomo, Ind. The Haynes was one of the first motor companies in the business and during the early days for many years made one and two-cylinder cars.

Some of these are said to be still in operation. The company hopes by this contest to find out where they are, and what condition they are in. Descriptions of the cars, with car numbers, should be sent to the factory. They will be looked up to determine the order in which they left the factory.

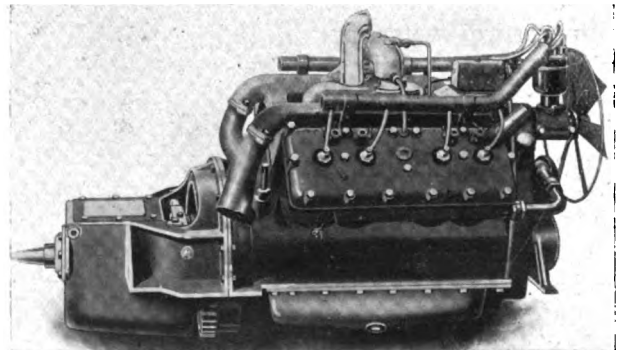
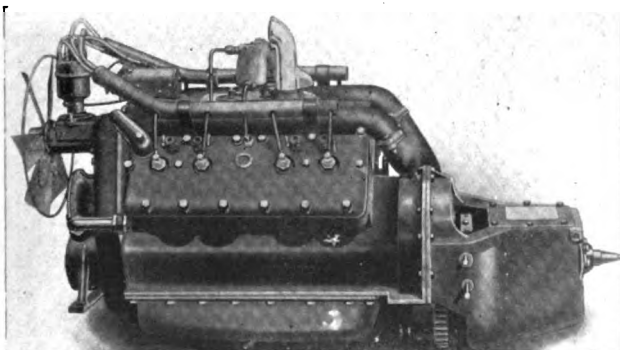
When the oldest one is decided upon it will be shipped in and a new car of the latest type given to its owner in exchange.



Driver's Compartment, Showing the Instrument Board.

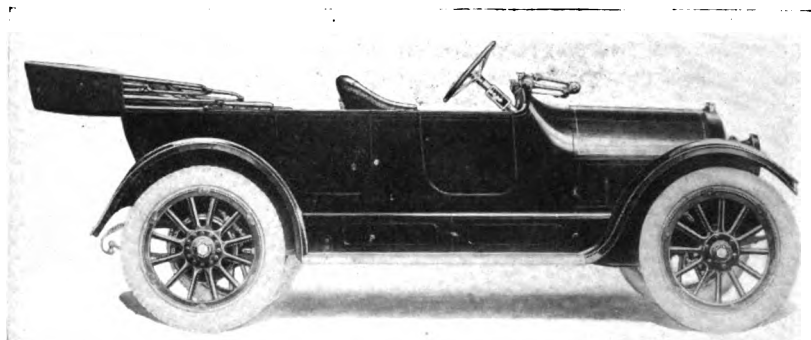
Front springs are semi-elliptic and the rear three-quarter elliptic and underslung. The rear spring fastening is unusual. The frame is split and the butt of the spring inserted in the end of the side member and clamped firmly through the frame.

Wheelbase is 110 inches. Artillery wheels have Baker demountable rims and carry 32 by 3½-inch tires, non-skid on the rear. The 12-gal-



The Unit Power Plant of the Oakland Model 50, Which Is Declared to Develop 71 Horsepower on Brake Test at 2600 Revolutions Per Minute.

OVERLAND MODEL 83-B HAS BLOCK CYLINDERS.



WHEN the Overland model 83 was announced last spring by the Willys-Overland Company, Toledo, O., the production schedule called for 50,000 cars during the year. That number was completed and sold by the first of the year, so that a new series was designed and production was begun at once. The price of both touring and roadster models has been reduced \$55.

The initial overhead, covering the cost of new tools and jigs, was paid off by the first 50,000 cars. This has in part enabled the price reduction. The company has also been fortunate in buying large quantities of materials in advance. It is said to have saved over \$3,000,000 alone on the present price of aluminum and similar savings have been made on other materials.

In the main the car which is designated as model 83 B, is similar to the one that sold for \$750. The chief difference is the new motor of the latest block cast cylinder design, in place of the former engine with its cylinders cast separately. The casting is made with a detachable head. The dimensions, $4\frac{1}{8}$ inch bore and stroke $4\frac{1}{2}$ inches, are same as those of its predecessor.

The motor is cooled by thermo-syphon system. The fan runs on ball bearings and the radiator is a cellular type with vertical water circulation. The radiator shell is pressed from one piece of sheet steel. There are swivel trunnion supports at either side to insure against chassis distortion and stresses.

Lubrication is accomplished by a constant level splash system. The oil is strained

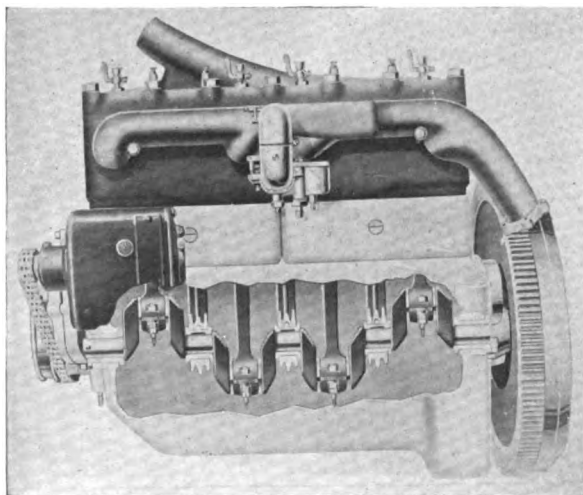
and the flow is indicated by a sight feed on the dash. The oil base, which is the lower half of the crank case, holds eight quarts. An improved type of carburetor, fitted with a hot air attachment, is used. The manner of adjusting it is exceedingly simple.

The Auto-Lite two-unit generator is placed on the left side of the motor at the front, and the motor is placed on the right side at the rear. The generator is driven, as in the previous model, by silent chain from the shaft, and the motor drives a gear ring on the flywheel through the Bendix attachment.

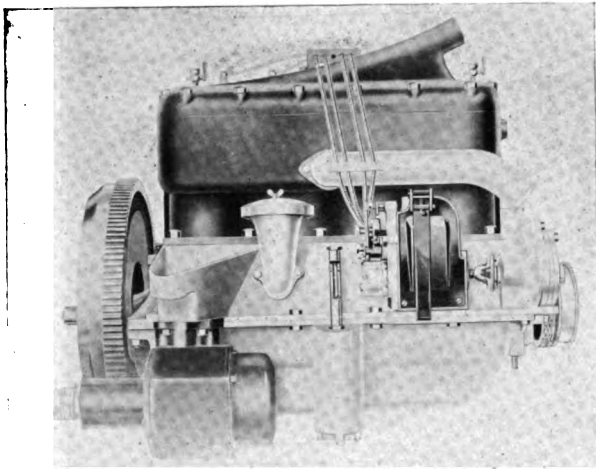
Shifting the starter gear is entirely automatic after the current has been sent to the starting motor. A weighted pinion is mounted on the threaded shaft, so that the weight carries the pinion into engagement when the shaft begins to revolve. The pinion screws forward automatically on its shaft until it reaches the end position, when the gears come into engagement with the teeth on the rim of the flywheel. A coil spring is provided to prevent the pinion engaging the flywheel with too great a shock.

When the engine begins to revolve under its own power it goes faster than the starting motor and the threaded shaft upon which the driving pinion is mounted. This backs the pinion up on the threaded shaft and throws it out of engagement. It is therefore impossible to harm the device by switching on the current when the motor is running, for it would automatically be thrown out of engagement at once.

There is no change in the clutch, which is the



Cutaway View, Showing Crankshaft and Bearings of Overland 83 B Motor.



View of Right Hand Side of the Overland 83 B Motor.

usual Overland leather faced cone. It is equipped with a brake to aid in gear shifting. Clutch pedals are adjustable to suit the physique of the operator. Spring pressed studs under the clutch facing assure easy and gradual engagement. The transmission gear set is a selective sliding type. There are three forward speed ratios and reverse. The gears are double heat treated. Annular ball bearings are used.

The steering wheel on the left side actuates a full gear and worm of hardened steel, which is adjustable to take up wear. The steering column is anchored at the top to take up vibration. Centre control levers have not been changed. Electric switches are located on the steering column, where they are easily reached by the operator.

The rear axle is a floating type, with four bevel differential gears, removable shafts and flexible roller bearings. The front axle is an I beam section, forged in one heating without welding. It is fitted with adjustable taper roller bearings. The front springs are semi-elliptic, 36 inches by $1\frac{3}{4}$ inches. The rear springs are three-quarter elliptic, 47 inches long.

Wheelbase is 106 inches, Wheels are artillery type with 12 hickory spokes and carry 33 by four-inch tires, non-skid in the rear and smooth in front.

The body is of typical Overland appearance. The cloth upholstery of the recent model has been replaced by Fabrikoid, a leather substitute of rich appearance. The body is a smooth streamline type, finished in Brewster green. The fenders are pressed from heavy

gauge sheet steel and have a graceful crown.

There is a new rain vision windshield, with ventilating features, that can be adjusted to many different positions. The speedometer is a magnetic type. There is an electric horn, a muffler cut out, license tag bracket integral with the tail light, tire carriers, extra demountable rims, hinged robe rail, foot rest, full set of tools, tire repair kit, jack and tools.

The front fastening of the one-man top is new. Instead of attaching to the rigid supports of the windshield, metal braces are supplied. They lie flat when the top is folded, but hold rigidly when it is open. These attach to the top at the point where the windshield supports would ordinarily come and are clamped in either end in sockets at the end of the windshield.

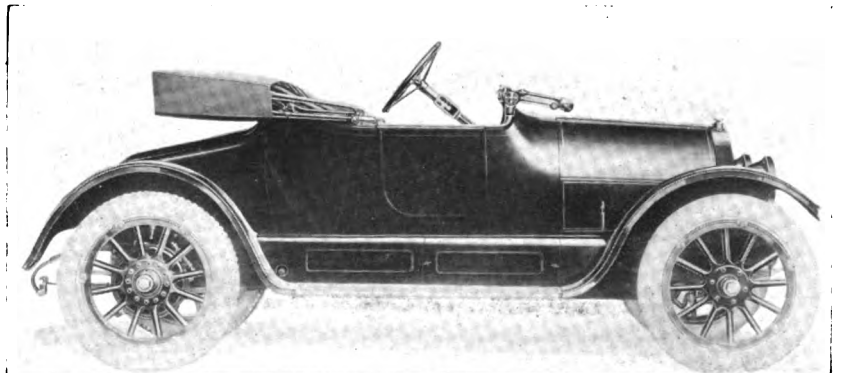
The price of the roadster is \$675.

A. A. A. TO PICK CHAMPIONS.

Instead of leaving that function to magazines, the American Automobile Association has decided that next year it will pick from the drivers who contest in the speedway and road races the champion drivers of the year—one for each class of races. It is probable that the winners will be presented with a medal of some sort and also with a cash prize.

BAY STATE ANNUAL MEETING.

The annual meeting of the Bay State Automobile Association will be held at the Hotel Lenox, Boston, Jan. 31, at 8 p. m. After the annual election of officers and the business meeting, a buffet lunch will be served free to members. There will be a vaudeville show and a general good time. The association hopes the meeting will mark the acquisition of 1000 active members.



Overland Model 83 B Roadster, Price, \$675.

CROSS LICENSE PLAN ADOPTED.

It was announced in New York City during the show that the cross licensing plan of the National Automobile Chamber of Commerce had been a success. Up to that time 79 companies, which control 350 patents, had signed. A number of other patents are under investigation, which will probably bring the total number up to 500.

Under this plan all makers who sign the agreement license all other signers under all their patents. The scheme has been possible because licenses under all other patents are more valuable than licenses under those which each individual controls.

This is something new in co-operative business and has attracted much attention from manufacturers in other lines who have patent difficulties among themselves. The leaders of the movement which brought this result about are Col. Charles Clifton, president of the N. A. C. C., and C. C. Hanch, W. H. Vandervoort, W. T. White, Wilfred C. Leland and Howard C. Coffin.

There are still a number of companies outside of the agreement who may come in later.

RECOMMENDS HEADLIGHT FOCUSING.

After two years' investigation of the subject of glaring headlights, the Standards Committee of the S. A. E. at its meeting on Jan. 4 recommended that the whole difficulty be overcome by provision for proper focusing of the existing headlights. Improvements in lamp and bulb design were also discussed and will be recommended to manufacturers. The present lights when focused properly and the supports bent at a certain angle can be made practically non-glaring.

Other action was taken by the committee on license plate standards, automobile springs, electric vehicles and iron and steel specifications, along with methods of testing them.

CHALMERS DISAGREES WITH FORD.

Motor car manufacturers generally do not agree with the views of Henry Ford on peace, according to Hugh Chalmers, who during the show told the New York newspapers that he believed the country should have a strong navy and the nucleus of a strong, well trained army.

He said that there were 5000 men at the Chalmers plant and that he would pay half their

wages while they served a month in military training camps. The men, he said, could not be expected to forego their wages for a month, as many of them have families and cannot afford to do so. But he thought if the manufacturers gave half the wages the men should contribute the other half, otherwise they would be making no real contribution to their country.

He spoke of the fact that the Wolverine Automobile Club had offered its cars to the government as a motor reserve corps and that Secretary Garrison had written letters to other organizations urging that they take up the reserve movement.

R. E. OLDS ON AMERICAN ROADS.

In the view of R. E. Olds, president of the Olds Motor Company, Americans have no cause to be pessimistic about the good roads movement here. He says in comparisons of American roads with those of Europe only three or four countries are ever mentioned, Britain, France, Germany and Italy.

In the others most of the roads are worse than those in America and even in those countries, in spite of their centuries of civilization, only the main travelled roads are improved, while the byways are very bad.

New England, he says, has more good roads than Britain, and California more than the Riviera, notwithstanding the fact that the constant freezing and thawing in New England and the northern states makes the roads much more difficult to maintain than they are in parts of Europe.

In short, America has done more good roads building in a shorter time than any other country and is quite likely soon to lead the world in this feature.

SIMMS MAGNETO'S LONG RUN.

On the world's record non-stop run made by a Maxwell car taken from stock, which was on the road continuously from Nov. 22 to Jan. 5, making an average of over 500 miles per day, the Simms high-tension magneto in covering the 22,022.3 miles gave 87,000,000 sparks without a falter, while the Simms-Huff single-unit generator during this period made over 109,000,000 revolutions of its armature shaft as a generator. The car is now on an extended tour throughout southern California. It was taken from stock, was not specially adjusted, and was similar to any other Maxwell car.

ELECTRIC BULBS FOR AUTOMOBILES.

Authority on Lamp Design Discusses the Subject Before the Annual Meeting of the Society of Automobile Engineers at New York City.

By HENRY SCHROEDER.*

THE tungsten filament used in bulbs has several interesting characteristics. The metal tungsten has a very positive temperature coefficient of resistance, that is, increased temperatures give increased electrical resistance, which is common with metals. The resistance of the filament at its normal operating temperature is about $12\frac{1}{2}$ times its cold resistance. This is graphically shown in the curve in Fig. 1, which also shows that other filaments do not vary so greatly. Carbon, not being a metal, has a negative temperature coefficient, but the gem filament has a positive temperature coefficient, and, being a special form of carbon, is therefore often called a metallized carbon filament.

On account of the variation in resistance of filaments at different temperatures, varying electrical pressures (voltages) do not produce corresponding variations in current (amperes) and energy (watts). The greater the increase in resistance with increase in voltage, the less will be the increase in amperes and watts. This gives the tungsten filament an inherent advantage over the other filaments.

Temperature Changes Candlepower.

The candlepower of a filament is very sensitive to changes in voltage, as slight changes in temperature produce great changes in candlepower. On account of the lesser variation in the wattage consumption with voltage changes of the tungsten as compared with other filaments, the tungsten filament varies less than other filaments in candlepower on varying voltage. The efficiency of a filament is measured in watts per candle, being the candlepower given by the filament divided by the watts it consumes, which is somewhat misleading, for the lower (numerically) the watts per candle, the higher (better) the efficiency. The characteristic curves of the tungsten filament on varying voltage are shown in Fig. 2.

Between the conditions of a daily discharged battery (1.8 volts per cell) and a fully charged battery (2.6 volts per cell) the variation in volts, amperes, watts, candlepower and watts per candle of a tungsten bulb, assuming 6.5 volts to be the average voltage on the bulb in three-cell systems, is as shown in table one.

Table 1.—Bulb Characteristics with Battery Charged and Discharged.

Battery Condition	Per Cent. Normal Volts.....	Per Cent. Normal Amperes...	Per Cent. Normal Watts.....	Per Cent. Normal C. P.	Per Cent. Normal W. P. C.
Fully discharged (1.8 volts per cell).....	68	79	54	23	233
Fully charged (2.6 volts per cell).....	120	111	133	190	70

This table indicates that the lighting load in amperes

may vary from 21 per cent. below to 11 per cent. above the normal amperes taken by the bulbs. The candlepower of the bulbs may vary from 77 per cent. below to 90 per cent. above the normal, and the wattage from 46 per cent. below to 33 per cent. above normal. This wattage variation is not a large amount compared to the horsepower of the engine, for a lighting load of two $2\frac{1}{2}$ -ampere headlight gas filled bulbs (approximately 21 candlepower each), two .84 ampere sidelights (approximately four candlepower each), one rear and one speedometer light (.42 ampere each, approximately two can-

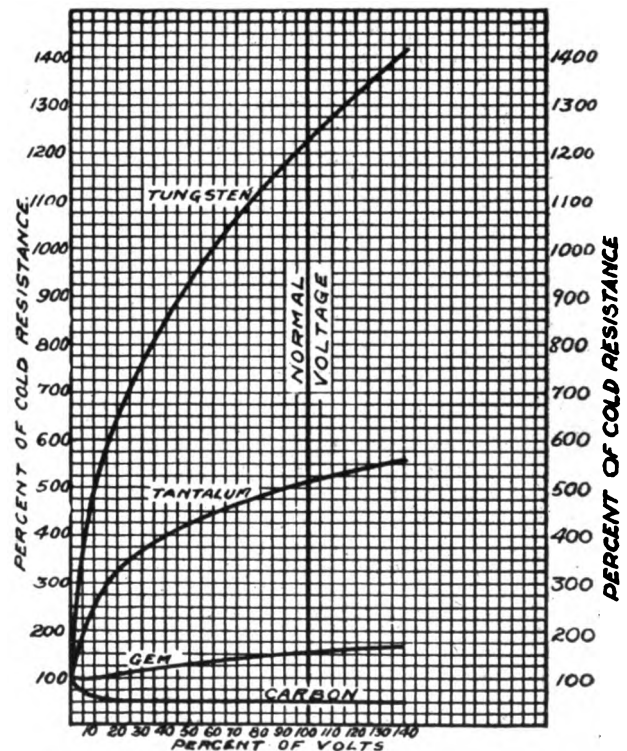


Fig. 1—Resistance Characteristics of Various Filaments.

dlepower) is less than 50 watts or about $1/16$ of a horsepower, as 746 watts equal one horsepower. The variation in candlepower is, however, most undesirable.

The life of a filament is very sensitive to a variation in voltage, and it is impossible to obtain an exact relation between life and efficiency. In view of the sensitiveness of bulbs to variation in candlepower and life on varying voltage, it is very important that the voltage on the bulbs be kept constant. Increasing the voltage, therefore, shortens the life of a bulb materially and decreasing the voltage materially reduces the candle-

*Edison Lamp Works, Harrison, N. J.

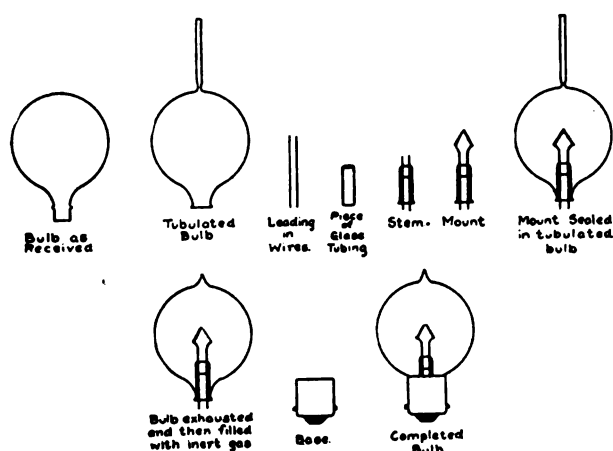


Fig. 3—Steps in the Manufacture of Bulbs.

power. Tests are now being made of different automobile lighting systems under various conditions of service to ascertain the extent of the voltage variations in practice.

The candlepower of filaments can be measured in two general ways, the simpler being measuring it in a horizontal direction. This does not, however, give the average candlepower in all directions, so that candlepower is often given as the "mean spherical," the former being called the "mean horizontal" candlepower. The light giving qualities of a headlight are dependent not alone upon the rated candlepower of the bulb, but largely on the position of the filament and the condition of the reflector. As stated, in service the candlepower of a bulb is very variable, depending on the voltage, so that instead of rating a bulb by its candlepower, which is purely nominal, it can be rated more accurately by the amperes it takes. For example, a headlight bulb can be rated better as a 2.5-ampere (not 21 candlepower) 6-8 volt bulb. It is the endeavor of bulb manufacturers, therefore, to have customers order headlight bulbs by amperes instead of candlepower.

Inert Gas Used in Bulbs.

There have been put on the market recently headlight bulbs filled with an inert gas, the object being to put a slight pressure on the filament so that it can be raised to a higher temperature without undue filament evaporation, one of the factors determining the life of a bulb. This is similar to the steam pressure in a boiler raising the boiling point of water. This gas pressure raises the temperature of rapid evaporation of the filament. The limiting temperature at which a filament can be operated is not its melting temperature, but the highest temperature that can be obtained without rapid evaporation, which so reduces the cross section of the filament at its thinnest point that it finally burns out. Tungsten has a lower melting point than carbon, but carbon evaporates readily at temperatures much below that at which tungsten evaporates. The pressure of the gas inside the bulb when lighted is about the same as the atmospheric pressure on the outside of the bulb.

These bulbs are impractical if made with filaments of small cross section, as the cooling effect of the circulating gas on the filament requires a great amount of electrical energy to maintain the temperature. In other words, unless the gain in candlepower (due to the higher temperature possible) is greater than the extra energy required on account of the cooling effect of the

gas, there is no advantage in putting gas in a bulb, as otherwise the efficiency would be no better than with a vacuum. In the present state of the art filaments taking one ampere are the smallest practicable, and side and rear lights are therefore made only in the vacuum type. The filaments are accordingly coiled in order to present as little of the surface as possible to the cooling effect of the circulating gas.

The various steps in the manufacture of bulbs are illustrated in Fig. 3.

Processes of Manufacture.

The glass bulb as received has a neck which is cut off at the flare. This piece of the neck which is cut off contains the internal strains in the glass. A hole is then melted in the glass bulb and a piece of glass tubing welded to it for the subsequent purpose of exhausting the air. For the stem a larger piece of tubing is used and one end flared out, which is afterward welded to the flare in the neck of the bulb. Two pieces of special wire are then inserted in the stem tube and the end of the tube opposite the flare welded together with the wires imbedded. These wires are called the "leading-in wires," connecting the filament with the base, and are of such a nature that their coefficient of expansion is the same as that of glass. This is necessary, as otherwise when the bulb is lighted and the glass expands, unless the leading-in wires expand at the same rate, air will leak into the bulb. Platinum was used formerly, but is used rarely at present; so there is practically no scrap value in a burned-out bulb, except for the slight amount of brass in the base.

The tungsten filament is made of pure tungsten powder formed into a slug by hydraulic pressure, holding the tungsten particles together by cohesion. This fragile slug is then put under a hood containing an inert gas so the tungsten will not oxidize and a very heavy electric current is passed through it, which heats it to a high temperature, electrically welding the tungsten powder together. The slug is then put through a rotary hammer, and formed out hot into a wire about the size of the lead in a pencil. This wire is then drawn out hot by means of diamond dies until it is of the proper cross-

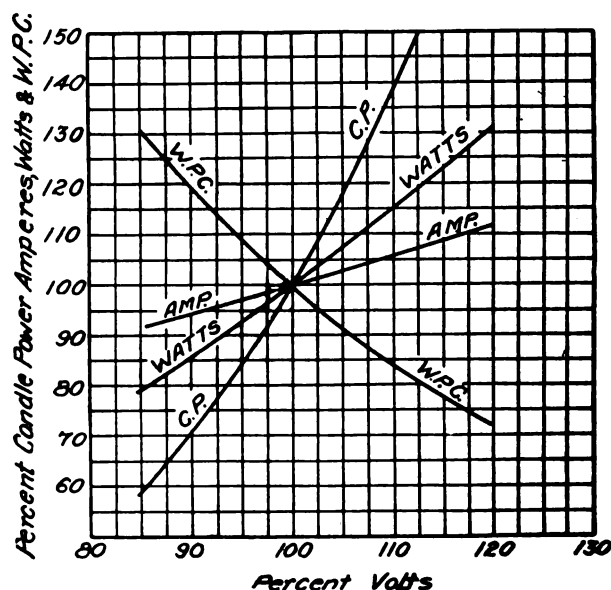


Fig. 2—Characteristic Curves of Tungsten Filament on Varying Voltage.

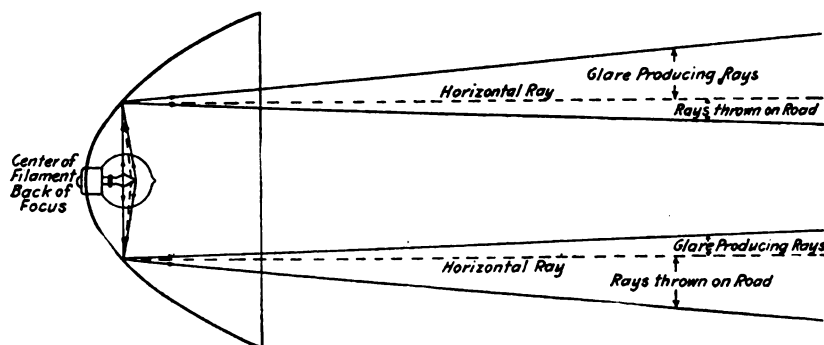


Fig. 4—Diagrams of Light Rays from Headlight.

section. Diamond dies have to be used as tungsten is such a hard substance that it will soon wear out a die of any other material. The wire is then coiled into its proper form and cut to the right length for the filament desired.

Filament Is Welded.

The ends of the filament are then either electrically welded or pinched to the ends of the leading-in wires, making the completed mount. The mount is then put in the glass bulb and the flare on the stem welded to the flare on the neck of the bulb, making an air tight joint. The bulb is then exhausted and in the case of a gas filled bulb the gas put in and the glass tube melted off, leaving a tip on the bulb. The base is then fastened to the neck of the bulb by a water proof cement, and the ends of the leading-in wires cut off and soldered to the base contacts, the bulb then being ready for shipment.

The best filament is one that is comparatively thick because it can be operated at a better efficiency than a thin one. The thicker a filament is, the more current it takes; a six-volt bulb has a much thicker filament than a 12-volt bulb of the same wattage. On the other hand, the loss in energy due to the heat conducted away by the leading-in wires, becomes a smaller percentage of the total, the higher the voltage is. From the standpoint of efficiency, therefore, there is practically no choice in bulbs for three or six-cell systems. Bulbs for nine-cell systems are not quite so good in quality, however, as either three or six-cell, and are somewhat more expensive to manufacture.

In any system the wiring must be large enough to carry the current without undue voltage drop, and as the voltage drop is proportional to the square of the current, very large wires must be used for low voltages. For three-cell systems, therefore, the single-wire ground return seems preferable from the bulb standpoint.

For headlight purposes the filament must be concentrated to a certain extent so as to bring it in the focus of the reflector. It is obviously impossible to make the filament a single-point source of light. The result is that every point on the surface of the reflector sends out a cone of light. This is illustrated in Fig. 4.

In order to prevent glare, which is the intense amount of light thrown upward into the eyes of persons, the rays of each cone of light which are thrown upward must be bent down. On the other hand, too much filament concentration will produce too intense and narrow a beam with a parabolic reflector, a certain amount of spread being required to light up the sides of the road.

The focal length for the usual headlight bulbs is $13/16$ inch. The focal length of the reflector in which these bulbs are used should be greater than $13/16$ inch in order to allow for adjustment of the bulb. The centre of the filament should preferably be back, instead of forward, of the focus of the reflector to get a spread of the beam of light, for the reason that when the centre is back of the focus a greater amount of the light rays is utilized and redirected by the reflector, producing a higher beam candlepower. In this case the majority of the reflected rays diverge directly from the headlight instead of crossing each other. If the centre of the reflector is producing most of the glare. If, in this case, the upper part of the front glass of a headlight is covered with a translucent material, the glare will be largely reduced, but should the centre of the filament be forward of the focus, this translucent material will not do the work it was intended for, as most of the glare will come from the lower part of the reflector. Similarly, devices put on a bulb to reflect the light, should be on the upper part of the bulb when the filament centre is back of the focus. With gas filled bulbs, however, this is the hottest part of the bulb.

Headlight bulbs for three-cell systems are now made for $6\frac{1}{2}$ volts, which is believed to be the general average voltage at the socket on all cars having such systems and will operate satisfactorily when the circuit varies within 6-8 volts, the bulbs being so marked. Side, rear and speedometer bulbs are made for $6\frac{1}{2}$ volts on

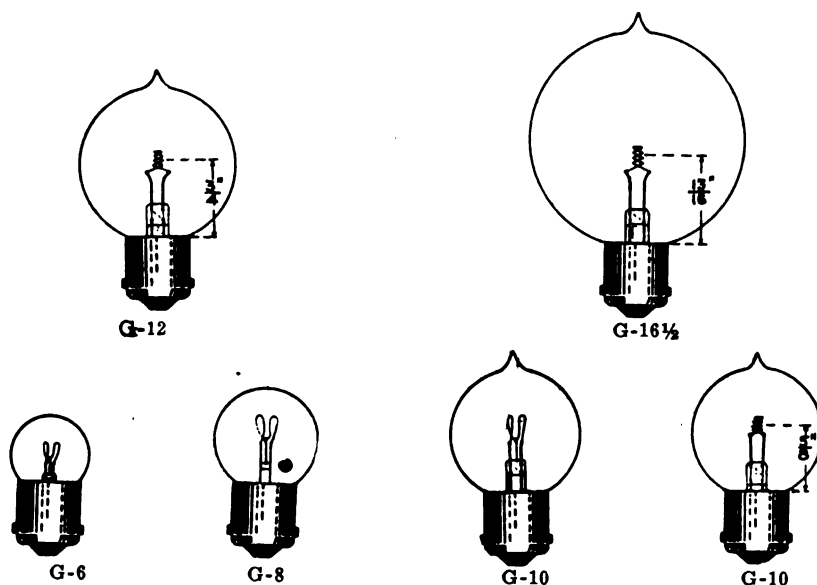


Fig. 5—Bulbs for Six-Cell Systems—12-16 Volts.

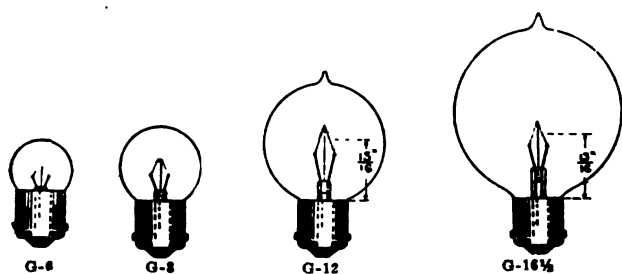


Fig. 6—Bulbs for Six-Cell Systems—12-16 Volts.

account of the lesser drop in voltage on their circuits. All bulbs for six-cell systems are made for 15 volts and for nine-cell systems for 21 volts, being designed for satisfactory operation with a voltage variation of 12-16 volts and 18-24 volts respectively. Heretofore bulbs have been made exactly to the voltage a customer's fancy might dictate, but for renewal purposes it is impracticable to have so many voltage bulbs in stock in garages and automobile supply stores. It is also desirable, for self-evident reasons, that there be one standard base; the single-contact bayonet candelabra, style 1100, for use on single-wire ground return systems seems to be the most popular at present.

Twenty-Four Varieties.

Taking into consideration only the standard sizes now listed for use on three, six and nine-cell systems and the different bases regularly used, there are about 24 different bulbs that should be kept in stock by a garage. In addition about 40 other sizes are generally

Table II.—Bulbs Used in the United States During 1915.

	Fitted with Single Con- tact Base	Fitted with Double Con- tact Base	Total
Three-cell systems.....	6,000,000	2,000,000	8,000,000
Six-cell systems.....	700,000	800,000	1,500,000
Nine-cell systems		500,000	500,000
Grand total.....	6,700,000	3,300,000	10,000,000

used, and if individual voltages had to be supplied, taking into consideration the different standard bases, a stock of over 200 different bulbs sizes would be required. Bulb manufacturers would certainly welcome one voltage system, one base and as few sizes of bulbs as possible. Garages and supply dealers cannot possibly carry a large variety of stock and as their knowledge of bulbs is very limited, they now have difficulty in supplying proper bulbs.

The diameter of the glass bulb is expressed in eighths of an inch and its shape by a prefix letter, G for round (globular), T for tubular, S for straight side, etc. Thus G-6 means a round bulb 6/8 or 3/4 inch in

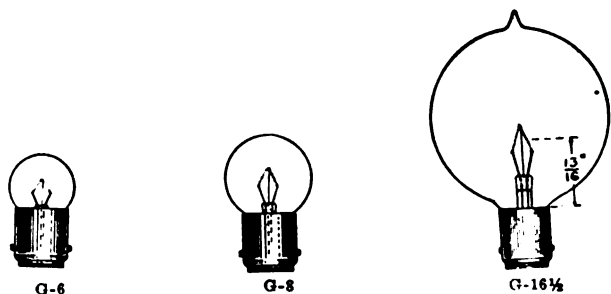


Fig. 7—Bulbs for Nine-Cell Systems—18-24 Volts.

diameter. The present standard vacuum bulbs as listed by the manufacturers are illustrated in Figs. 5, 6 and 7, and the gas filled headlight bulbs in Fig. 8. The various bases used are illustrated in Fig. 9.

The total number of bulbs used in the United States for automobile lighting during 1915 is estimated at about 10,000,000, as given in Table II.

Information received from 85 car manufacturers regarding their 1916 model cars indicates the following:

Bulbs for three-cell systems are increasing in favor, for six-cell systems decreasing in favor and for nine-cell systems remaining about constant. The single-contact base is gaining and the double-contact losing in favor. About three-quarters of the bulbs used for three-cell systems are fitted with single-contact base, and this amount is increasing. Of the bulbs used for six-cell systems, up to the present time little less than one-half of them are fitted with the single-contact base. It is indicated that next year nearly three-quarters of them will be so fitted. Practically all of the bulbs used for nine-cell systems have been and will be fitted with the double-contact base. This information is indicated in Table III.

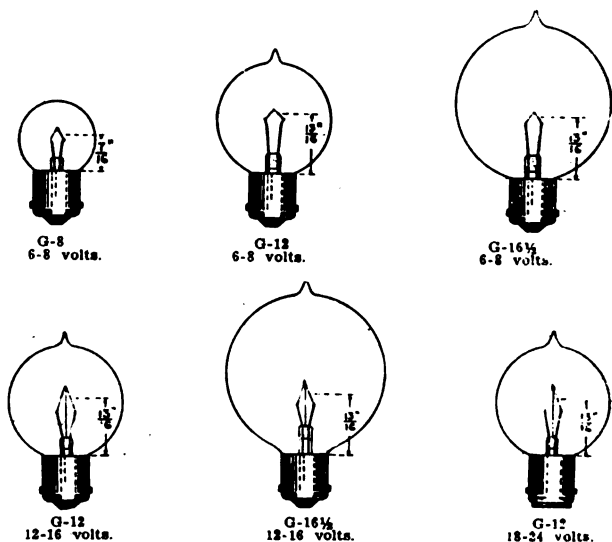


Fig. 8—Gas Filled Headlight Bulbs.

The special voltage headlight bulbs used two in series on magneto, which requires the use of a double-contact base, unless the fixtures are insulated from

Table III.—Bulbs Used in 1915 and 1916.*

	Percentage, 1915 Grand Total.			*Percentage 1916 Grand Total.		
	Single-Contact Base	Double-Contact Base	Single and Dou- ble Contact	Single-Contact Base	Double-Contact Base	Single and Dou- ble Contact
Battery System						
Three-cell	60	20	80	70	15	85
Six-cell	7	8	15	7	3	10
Nine-cell	0	2	5	0	2	2
Total.....	67	33	100	77	23	100

*Model cars only.

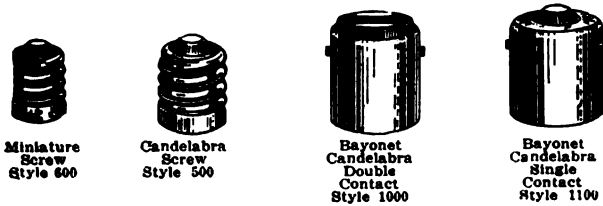


Fig. 9—Bases for Incandescent Bulbs.

each other (in which case the single-contact base can be used)—have not been included in either of the tables given.

For electric vehicles three sizes of bulbs are made: 8, 15 and 25 watts, for 32, 42, 62 and 82 volts, designed to operate on voltages of 30-34, 40-44, 60-64 and 80-84 volts respectively, as shown in Fig. 10.

The eight-watt bulb is used as a rear light and the 15 and 25-watt for sidelights and headlights. On account of the high voltage the filament cannot be easily concentrated to produce an intense beam in a small parabolic reflector, but electric vehicles do not need such a powerful beam headlight on account of their slower speed.

SAN FRANCISCO SANDS ITS STREETS.

To prevent skidding and other motor car accidents on its smooth asphalt pavements when they are wet, the street commission of San Francisco has been sanding the streets on damp and rainy days with a coarse ocean sand. This has been found to make the cars much more easily controlled and to have reduced accidents very considerably.

About 100 blocks of pavement are covered every morning by three spreader teams. The sand, dried and loaded in the spreader, costs \$1.75 per yard and about six cubic yards are required. The total cost of the spreading is \$20 a day. A sand spreader has been devised by D. J. McCoy, superintendent of streets, for use on a motor truck. It is able to cover the whole area at a cost of about \$18.

The effect of the use of the sand on the asphalt pavements is not yet known. There have been predictions that it will cause the asphalt to disintegrate, but the system has not yet been in use long enough to determine whether or not this is so.

RUBBERLESS TIRE IS INVENTED.

A patent on a rubberless tire has been applied for by an Austrian engineer named Von Dunikowski. The tire is of the pneumatic type and consists of certain wood and vegetable fibers with a binder. This binder contains no rubber. There is an exterior casing and an interior tube. The chief material is willow and birch fiber. It is stated that a car equipped with the new tires has run 500 miles and that signs of undue wear are not apparent.

AWKWARD TAG LAWS IN DELAWARE.

The law relating to automobile registration tags in Delaware requires that every car be equipped with a tag of the current year. It allows no grace and last year the police began on New Year's to make arrests of motorists who had not changed their tags overnight.

Some had put in their applications several days before, but had not received their tags. This year the secretary of state announced that the 1916 tags would be recognized after Dec. 15, but the courts held that under the law this could not be done.

The result was that change had to be made on New Year's day or New Year's eve or the car owner had to lay up his car for a time. An attempt will be made to have the state legislature at its next session change this.

PRISONERS TO BUILD BRIDGES.

While much success has been attained all over the country in using prisoners for ordinary road work, it has been the general impression that they could do successfully only low grade labor. But A. D. Williams, chairman of the State Road Bureau of West Virginia, reports that 25 convicts have been assigned in that state to build two concrete bridges. One of these will be an overhead railroad crossing and the other an undergrade crossing. Convicts have been used on the roads in West Virginia with very good success. In McDowell county the roads are now all in first class condition. Many of them were impassable when the convicts were put to work three years ago. County prisoners from the jails, as well as those from the penitentiary, are employed.

COMING EVENTS.

January.

Jan. 29-Feb. 5—Show, Columbus, O.
Jan. 29-Feb. 5—Show, Minneapolis.
Jan. 31-Feb. 5—Show, Fall River, Mass.

February.

Feb. 7-12—Show, Worcester, Mass.
Feb. 7-12—Show, Kansas City, Mo.
Feb. 8-11—Show, Sioux Falls, S. D.
Feb. 8-12—Show, Jamestown, N. Y.
Feb. 9-12—Show, Peoria, Ill.
Feb. 12-19—Show, Hartford, Conn.
Feb. 14-19—Show, Des Moines, Ia.
Feb. 14-19—Show, Cedar Rapids, Ia.
Feb. 15-19—Show, Trenton, N. J.
Feb. 19—Show, Newark, N. J.
Feb. 19-26—Show, Harrisburg, Penn.
Feb. 20-27—Show, Grand Rapids, Mich.
Feb. 21-26—Show, Bridgeport, Conn.
Feb. 21-26—Show, Louisville, Ky.
Feb. 21-26—Show, Omaha, Neb.
Feb. 21-26—Show, Portland, Me.
Feb. 21-26—Show, South Bethlehem, Penn.
Feb. 21-26—Show, Syracuse, N. Y.
Feb. 21-28—Show, Pittsfield, Mass.
Feb. 28-March 4—Show, Paterson, N. J.
Feb. 28-March 4—Show, Utica, N. Y.
Feb. 28-March 4—Show, Watertown, N. Y.
Feb. 29-March 4—Show, Sioux City, Ia.
Feb. 29-March 4—Show, Fort Dodge, Ia.

March.

March 4-11—Show, Boston.
March 8-15—Show, Brooklyn, N. Y.
March 18-25—Show, Pittsburg, Penn.
March 21-25—Show, Deadwood, S. D.
March 28-April 3—Show, Manchester, N. H.

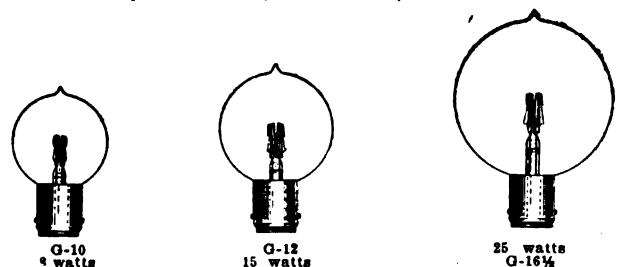


Fig. 10—Electric Vehicle Bulbs.

INDUSTRIAL HAPPENINGS AND COMMENT.

THE Packard Motor Car Company has acquired a large tract of land on Lake St. Clair, near Mount Clemens, Mich., to be used as an aviation field and landing place for aeroplane tourists. Henry Joy, president of the Packard company, has become much interested in aviation and for the past six months tests have been in progress there to prove the value of the 12-cylinder motor for aeroplane work. Experimental aeroplanes will be fitted with motors designed by the Packard engineers and constructed at the Packard plant. It is understood that the field will be equipped with hangars, repair shops and supply stations for the convenience of aero tourists.

The Nordyke & Marmon Company, Indianapolis, advises that its employees have organized a social club

Time and a half will be paid for overtime on week days and double time on Sundays.

The Studebaker Corporation advises that during the two weeks following its announcement of the new series 17 Studebakers, 5000 cars were delivered, which establishes a record for that company. New demonstrators of that series have been placed with about 3000 dealers. The distributors are at present demanding more cars at a rate that suggests there may be a shortage of 100,000 cars in 1916, unless production can be speeded up. The original schedule was for 60,000, and this was increased to 75,000 early in the season and recently was raised to 100,000.

The Dayton Engineering Laboratories Company, Dayton, O., recently completed a seven-story fireproof

building containing more than five acres of floor space and measuring about 400 feet long. The company loaned it to be used as an exhibition hall for the Greater Dayton industrial exposition, which was held Jan. 14-22. The building has been constructed to afford the Delco company greater manufacturing facilities, which have been made imperative by its increased volume of business. The company's production of complete lighting, starting and ignition systems last year reached a total of about 125,000.

The Firestone Tire and Rubber Company, Akron, O., has scheduled a production of approximately 1,000,000 demountable rims during 1916. The rim plant is now being enlarged by the addition of a 50 by 100 foot building.

This department used about 4,000,000 pounds of steel during the month of December last, the rims being on contracts with 79 car manufacturers.

The Consolidated Car Company, Detroit, Mich., maker of Abbott-Detroit cars, has concluded a deal whereby it has taken over the plant of the Schweppe & Wilt Company at Meldrum and Lafayette avenues, East. The last named is understood to have moved to a new plant on Mt. Elliott avenue.

The Harry A. Lozier Company, Cleveland, O., has leased for a short term the plant formerly occupied by the Royal Motor Car Company. Until permanent location can be secured the H. A. L. 12-cylinder car will be made there.

The Chevrolet Motor Company is to build a new concrete assembling plant in Atlanta, Ga., where 15,000 cars are to produced annually. The manager of the branch is A. H. Simms. The exact location and other details concerning the plant have not yet been made public.



The New Seven-Story Delco Building.

known as the Accelerator Club, with rooms just across the street from the company's plant.

The Michelin Tire Company, Milltown, N. J., announces that because its business in automobile tires has increased to large proportions during the past two years, it is compelled to enlarge its manufacturing facilities. A contract for the erection of a single-story brick building, 53 by 117 feet, with saw tooth roof, has been awarded to a New Jersey contractor.

The Chevrolet Motor Company's plant near Tarrytown, N. Y., was partially destroyed by a fire that originated by gasoline explosion in the testing shed. The amount of the damage was given as about \$50,000. The building was a one-story brick structure, 100 by 65 feet.

The Fisk Rubber Company, Chicopee Falls, Mass., recently announced a reduction in the number of working hours of its force from 55 hours to 50 a week. Wages do not decrease. From now on the plant will be operated on two shifts, instead of three, as formerly. The night force in addition to receiving the same benefits as the day shift, will be paid two cents an hour extra.

PRACTICAL MOTOR CAR REPAIRS.

OFTEN when a demountable rim is not securely clamped to the wheel, projections will wear the steel rim and wooden felloe of the wheel and frequently the felloe will split in the centre. A remedy for this condition is shown in Fig. 138. The first operation is to place

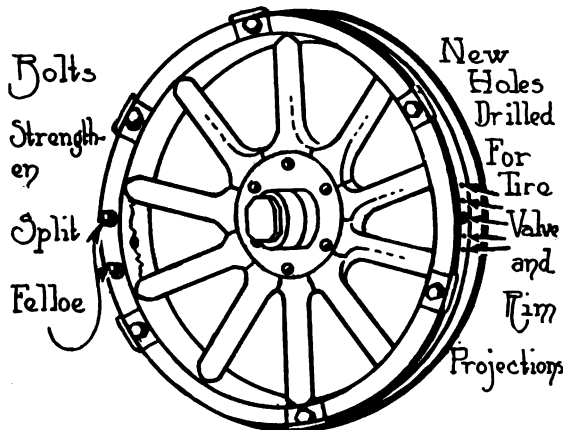


Fig. 138—How to Repair a Wooden Felloe That Has Split.

the split section in water and allow it to soak for several hours. Then drill two small holes through the felloe at opposite points. The split section can then be drawn together by stove bolts. At a point opposite the split section a hole should be drilled through the steel rim and felloe of the wheel to receive the tire valve stem. Small depressions should then be drilled to receive the projections in the rim.

MAKING TAPPET ADJUSTMENTS.

There is a well defined natural law that metal will expand when heated and contract when cold. This principle must be followed when adjusting the valve tappets in the engine. If adjustment is made when the motor is cold, it will not be accurate, because of the expansion of the metal when warm. Adjust the tappets only after the motor has been operating for a considerable period.

TIRE CHAINS.

A well known tire authority advises that anti-skid chains should not be attached tightly to the tires, as this would retain them in one position. The chains should be loose enough so that they can work slowly around the tires. This condition will prevent undue wearing of the tires.

OVERHEATING.

Usually when the motor overheats under ordinary running conditions the trouble is due to a too lean mixture. Such a mixture will ignite instantly, but will burn more slowly than a proper mixture. If the gas is over rich the tendency will be to produce much heat but

little power. By opening the relief petcocks on the cylinder head, the operator may determine whether or not a proper mixture is being used. If this test is made in a dark place, the properly mixed fuel will emit a blue flame.

SLACK IN TIE ROD CONNECTIONS.

The connections between the steering knuckles and the tie rod should be kept as tight as possible as a very slight slack will serve to alter the alignment sufficiently to cause excessive tire wear. This condition is also dangerous, as it makes accurate steering difficult.

LOCATING KNOCKS.

Frequently the exact location of a motor knock is difficult to find, but by adopting the suggestion in Fig. 139 the work can be much simplified. The equipment consists of a steel rod, one end of which is placed against the motor and the other end held between the teeth of the operator or against the ear. The advantage of this method is that it is possible to accurately locate the knock, whether it is in the mechanism of the motor or in the transmission, etc. The sound is naturally transmitted to the motor.

UNIFORM PROTECTOR.

The majority of uniforms worn by chauffeurs are fitted with brass buttons. When these have been exposed to the weather for a considerable period they become tarnished. A little brass polish, however, will quickly renew their lustre. It requires the utmost care to polish the buttons without touching the uniform with the polish. A simple home-made device that will prevent the polish from contacting with the uniform is illustrated in Fig. 140 B. It is not unlike the common cigar cutter. Two pieces of sheet metal are hinged together and a small groove cut in the inner surface of

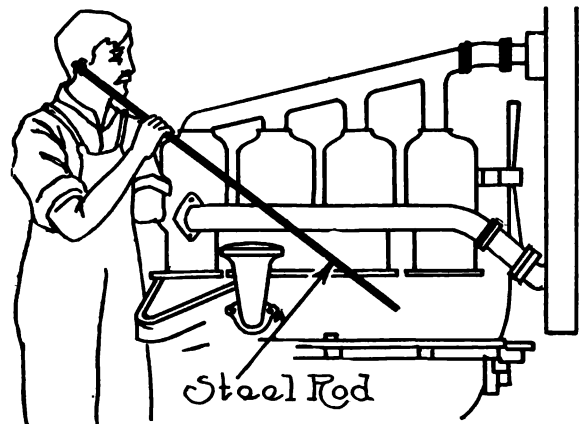


Fig. 139—A Practical Method of Determining Accurately the Source of Trouble in a Motor.

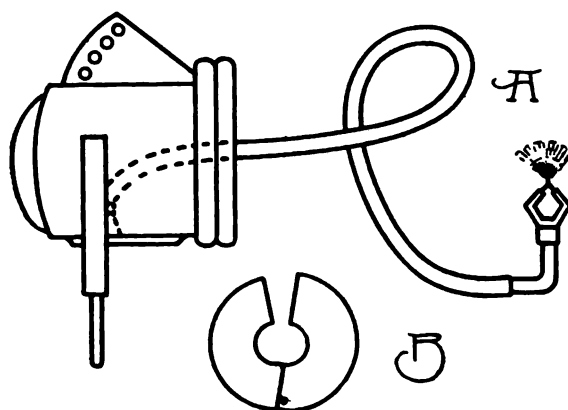


Fig. 140—A, How to Make an Extension Acetylene Light; B, Simple Device for Protecting the Cloth While Cleaning Metal Buttons.

each to fit snugly around the thread. This protector fits under the button and covers the cloth around it.

EXTENSION ACETYLENE LIGHT.

Cars equipped with acetylene headlights can be equipped with the all-purpose extension light illustrated in Fig. 140 A. It consists of a short length of slender piping that is threaded at one end and then bent to form an elbow. An ordinary acetylene burner is then screwed on to the threaded end. A suitable length of rubber tubing completes the outfit. This attachment can be used to furnish light when changing tires, heating soldering iron, sweating on parts, etc. Care should be taken not to place a naked flame near the gasoline line or engine. The light is, however, suitable for all exterior work.

SILENCING GEARING.

Worn transmission gearing is apt to be very noisy in operation. An effective method of silencing this is to use castor oil as a lubricant. It can be used to particular advantage in worm gearing.

HEADLIGHT DEFLECTORS.

There is a country wide movement at the present time to compel the dimming of glaring headlights.

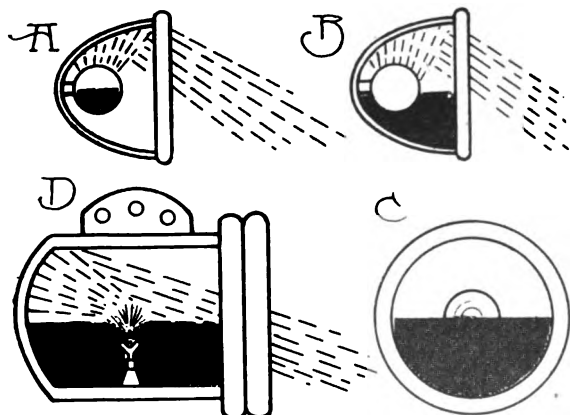


Fig. 141—Four Methods by Which Glare Can Be Eliminated in Headlights.

There are several satisfactory dimming devices on the market, but if the owner does not wish to purchase any of these, there are a few simple methods by which the desired result can be obtained. If it is an electric headlight, the glare can be eliminated by painting the lower half of the bulb, as shown in Fig. 141 A. Another method is to paint the lower portion of the reflector, as in Fig. B. In both instances it is advisable to use black paint. Still another method is to place a piece of silk cloth over the lower half of the lens, as shown in Fig. C. The principle of painting the lower half of the bulb and reflector and placing a piece of silk over the lower half of the lens is that the lower part of the reflector casts the light forward and upwards, while the upper half of the reflector casts the light rays forward and downward. When gas headlights are used, a simple method that will eliminate the glare is to paint the entire lower half of the lamp, except the lens, with black paint. This method is shown in Fig. D.

A SIMPLE CAR LOCK.

The simple, but substantial, locking arrangement shown in Fig. 142 will prevent either the pleasure

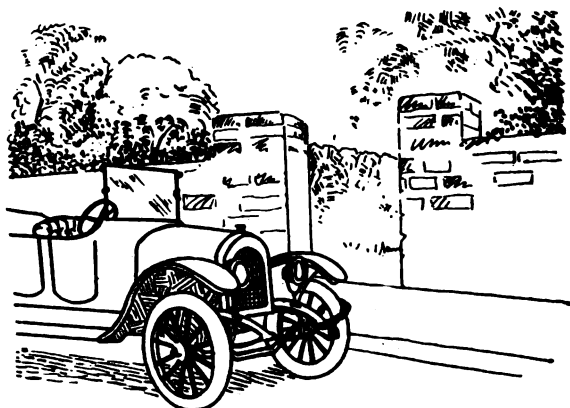


Fig. 142—A Practical Way by Which to Secure the Car from Being Stolen.

car or truck from being placed in motion. It consists of a four-foot length of steel chain and a strong padlock. The chain is passed around the frame of the car and the tire and wheel as shown, and secured by the lock. When not in use it can be easily carried in the tool box of the car.

LOCATING NOISES.

Frequently it is exceedingly difficult to distinguish whether sounds developing in a car arise in the chassis or engine. An easy method of determining the exact location is to select a straight road with a long grade and, with the engine shut off, allow the car to coast.

A soldering outfit is a handy acquisition to the equipment of any machine. Frequently the conditions will not permit the carrying of a blow torch to supply heat for the iron, without damaging it considerably. Acetylene headlights offer an excellent source of heat. Turn the gas on at the tank so that a large flame is produced and then hold the iron as near the top of the flame as possible. When this method is used, a small soldering iron should be utilized.

MOTOR STARTING AND CAR LIGHTING.

Characteristics and Qualities of Some of the Types of Generators Developed for the Westinghouse Systems—Details of Construction and Operating Methods.

CURRENT for lighting the lamps or starting the engine of the gasoline pleasure car must be generated by a dynamo or a combination machine that is known as a motor-generator. The motor-generator may be one of several types—the one in which it will serve as a motor until a definite speed is attained, when it will begin to generate energy and will continue this duty as the revolutions are increased and decreased to a point when it will again take energy from the battery as a motor; or it may be so constructed that it will begin generation of current at a specific number of turns and will increase this to a given output and will then decrease production until it will cease, or it may be a motor and a generator, each independent of the other, that are contained in the same housing, and which are so designed that they serve each a purpose through a single coupling.

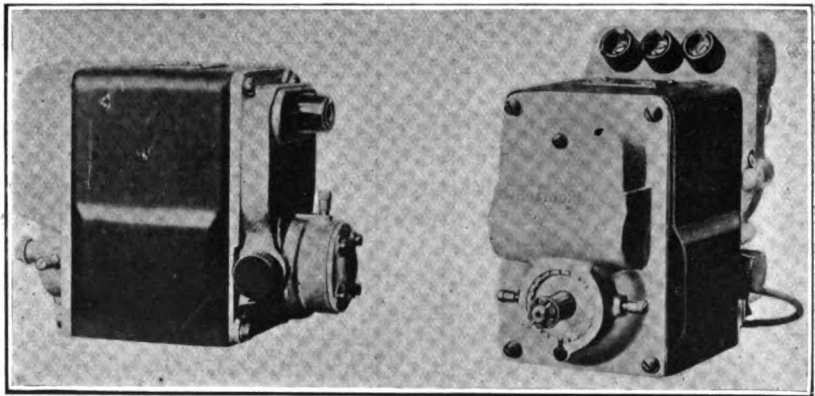
The generator differs from the motor in that it is operated whenever the engine is turned. The purpose of the generator is to supply current to the battery, which is drawn upon by the lighting system, the ignition system and by the starting motor. The generator that is designed for efficient current production, as for a stationary lighting plant, is usually intended to be driven at approximately a constant speed, and the purpose generally sought is to obtain the largest output with the smallest consumption of power. This would mean a conservation of energy, because power must of necessity have a value. To illustrate, in the economic generation of electric current a machine would be designed to have a definite output, and the work would be as near this production as would be practical.

A Different View of Economy.

The generator used for creating current for the pleasure automobile is not designed with the same view of economy. The car will be driven at constantly varying speeds. At times it will

move so slowly that the machine will have no output whatever, and it may be driven at very high rates of speed. The average car will probably have a maximum speed of 50 miles an hour, and there may be occasions when it will be driven as fast as is possible. The machine will possibly have an average speed of 20 miles an hour. At any rate, these figures will serve to demonstrate the facts of ordinary requirements of car lighting systems.

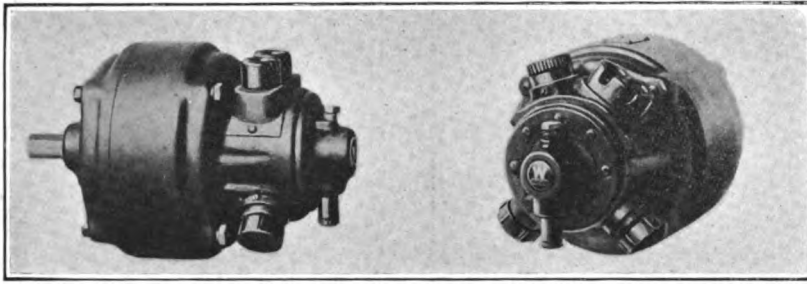
Here is a car that has extremely variable speed possibilities, and the driver can be expected to range from the one extreme to the other. The automobile that is equipped with a governor will be driven to the limitation permitted. Now any



Rectangular Frame Types, Westinghouse Generators: At Left, No. 208-R, for Lighting Only, with Automatic Potential Regulator; at Right, No. 236, for Ignition and Lighting, with Compound Field Voltage Control.

generator must be turned a certain number of revolutions before it will begin to produce current, and were a generator for an automobile lighting system to continue production in ratio to speed it would have a very large output, especially as there is a very general desire among electrical engineers to have comparatively high efficiency at low speeds. Were these machines designed and operated as are those that are used for stationary lighting plants, in which the current produced is steadily increased up to the maximum operating speed, the result would be far from satisfactory.

The designer of the generator presupposes that the car will be driven on the high speed gear



Round Frame Types: At Left, No. 400 Generator, for Lighting and Ignition, with Separate Voltage Regulator and Cutout; at Right, No. 450, for Lighting and Ignition, with Third Brush Voltage Control.

ratio of the power transmission gearset, which calls for the minimum number of engine revolutions. The engine would probably be turned faster when the vehicle is driven in intermediate or low speed gear ratios than when directly coupled, but only for a comparatively small part of any given operating period unless in abnormal conditions. No change can be made in the means of coupling the generator, so it is driven at any car speed.

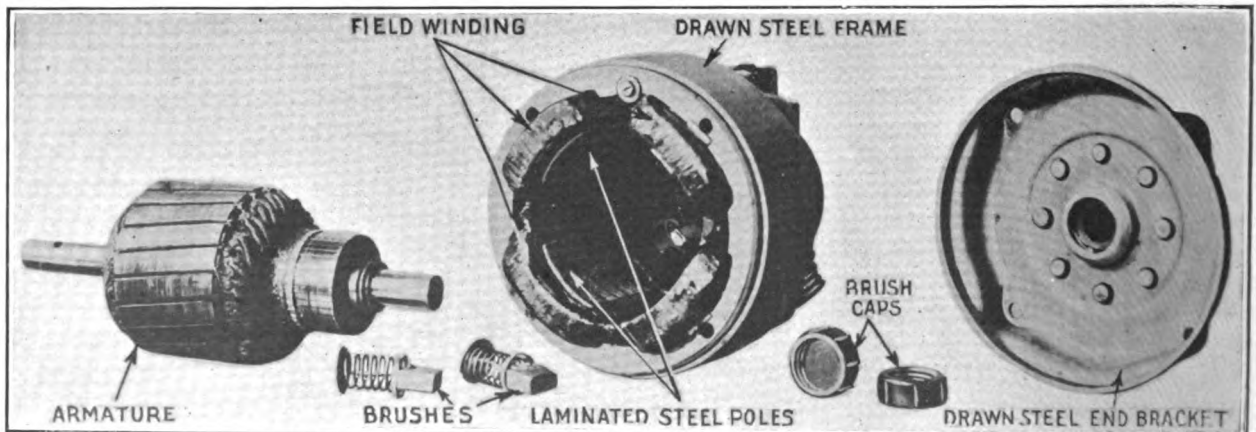
The designer believes that he wants the smallest practical unit for various reasons, all of which influence the design. The first of these is the cost of materials, for manufacturing expense must be kept down so far as possible. The second is size, because the space in which the generator is installed is generally very limited. The third is that unnecessary weight adds to the cost of vehicle operation and serves no useful purpose. In keeping with the general tendency to minimize weight, the battery utilized in connection with the generator is as small and as light as is consistent with dependable service, and the reasons that apply to generator design can be applied equally well to battery proportions.

in weight because of the design and construction. The heavier plates will withstand the action of the electrolyte in charging and discharging for a longer period with relatively the same capacity, and will be in the end a more satisfactory equipment. The lighter battery will give excellent service for a more limited time and will be more susceptible to the general influences that cause deterioration.

Naturally battery weight is governed by the number of cells, and a three cell battery will be lighter than one of six cells. The chief difference between the two in general operation will be the voltage, and for all practical purposes the battery of six volts will afford as satisfactory service as that of twice the voltage. For this reason the six-volt system is generally utilized.

Charging Capacity of Generator.

The charging capacity of the generator must be that which is required by the battery. The battery holds the voltage of all lines of the system practically the same as its own pressure under all conditions, but the amperage is an exceedingly important matter. The battery is expected to afford a source of current supply for



A Round Frame Type Generator Disassembled, Showing the Different Components of the Machine and Their Relative Proportions.

energizing the starting motor for a reasonable period, and it must also carry the load of the lighting and the ignition system for whatever periods may be required when the generator is not operated.

The current production of a generator at average vehicle speeds will range from 10 to 20 amperes, the output depending upon the consumption of energy by the starting motor and the lights, and by the battery in ampere hours. The generator ought to be so designed that it will not normally generate more than one-eighth the current capacity of the battery in ampere hours. That is, if the battery is six volts, 120 ampere hours, the normal charging rate ought to be approximately 15 amperes. The battery may be charged at less than the normal rate without deterioration, but charging at higher rates will cause excessive gassing and this will dissipate the electrolyte without serving any useful purpose, and this dissipation will entail greater care and attention.

Small Range of Production.

But as the generator must be driven by the engine, which will occasionally be turned at very high rates of speed, there must be some form of control. If the generator will produce a normal charging current at 10 to 12 miles an hour, it must be so regulated that it will afford its maximum production at approximately 15 miles an hour, and beyond that speed, from 15 to 50 or more, to charge at no greater current rate. The load is carried by the battery—the lamps and the other electrical equipment—ought to be approximately what is produced by the generator, so that in ordinary operation there will be no drain upon the battery, and whenever this is drawn upon for energy the current can be restored by the generator during those periods of use when the lamps are not required.

The generator is not subjected to periods of unusual stress, as is the motor when starting the engine, but it is always operated, and normally there is some degree of wear, especially of the brushes and of the commutator unless these receive the attention that is necessary. Most generators of automobile lighting systems are mounted on annular ball bearings and means of lubrication are provided that will minimize the wear upon these.

Charging Is Practically Automatic.

The charging of the lighting battery is automatic in practically all systems, and the one requirement in using it is to see that it functions normally, which can be noted almost at a glance.

The Westinghouse lighting equipment, which is usually used in pleasure cars, consists of a generator and a lighting switch, an ammeter or voltmeter, fuse and coupling boxes and a battery. This is frequently used in connection with a starting motor in the two-unit system, and very often in combination with an igniter that is installed upon or assembled with the machine.

Generally the Westinghouse equipment is the single wire (grounded return) system, which has been approved because of its simplicity and reliability after extended service and careful obser-

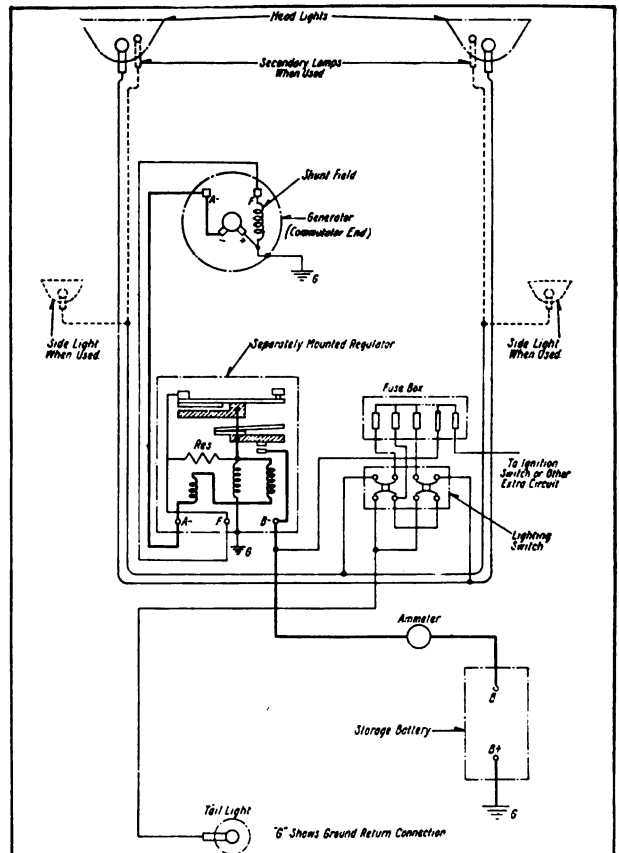


Diagram of Connections of a Complete Automobile Lighting System with Separately Mounted Regulator.

vation. In this the negative terminal of the battery is connected to the electrical units and the lamps through the switches, and the positive terminal of the battery is connected to the metal frame of the chassis, the car frame serving as one conductor for the system. As the positive terminal of each unit and each lamp is also connected to the metal frame of the car, either through mounting or by cable, the circuit is completed when the switch is closed. The two-wire system is used at the request of the car manufacturer that this equipment be provided, and while

the same principles of operation will apply to both systems, they differ somewhat in details of construction.

Generators Small and Compact.

The claim is made for the Westinghouse generators that they are small, compact and light in weight, and they can be readily installed on any engine, requiring but limited space at the side of the cylinder block. These are always coupled directly to the driving shaft, which obviates the use of high speed chain, friction pulley or auxiliary gear drive, this making for a very durable and dependable equipment.

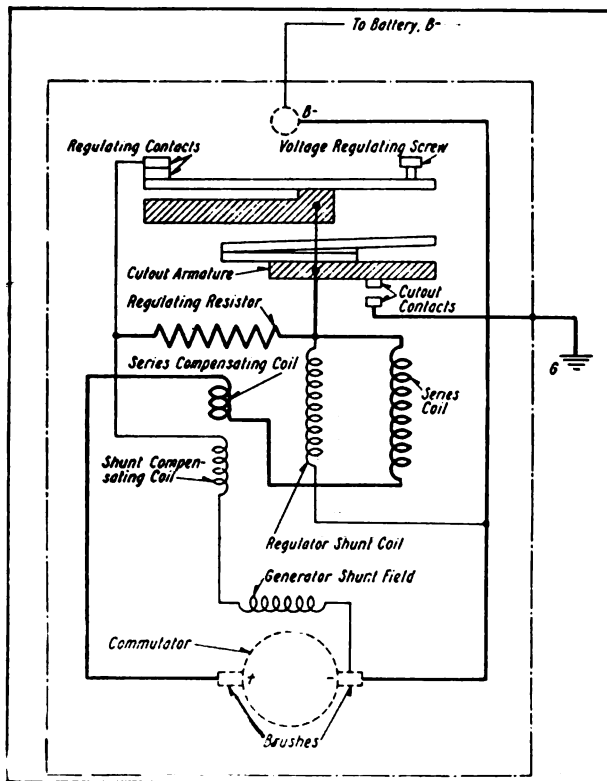


Diagram of the Connections of a Westinghouse Generator with Self-Contained Regulator.

The generators are in two general forms, being either rectangular or round, both types being specially adapted to conditions that are generally met with in engine construction. The frames are substantially constructed, those of the rectangular types being of cast steel, and those of the round type being of drawn steel. The end plates of the rectangular frames are aluminum castings that are carefully machined and which are fitted for the large armature shaft annular ball bearings, while the end plates of the round frame generators are drawn steel.

The field windings of the generators are in

two forms, those of the rectangular type machines being assembled above the armature, and those of the round types having four poles and four windings so disposed that they practically encircle the armature. The armatures are slotted drum types with cores of soft iron laminae, the slots being slightly spiraled with reference to the axis of the armature to insure against high temperature and to obtain noiseless operation. The commutators are large and of high quality copper.

The windings of the armature and the field coils are shaped on forms. The field coils and the armatures after being wound are impregnated with an insulating compound that is impervious to water, is not affected by oils or grease, and which will endure a constant temperature of 250 degrees Fahrenheit without heating, or a somewhat higher degree of heat for a short period. The field pieces are soft iron laminae. The construction of the field pieces and the armature cores insure high magnetic permeability. The brushes are large size and ought to endure for years in continuous service. When the generators are assembled they are fully enclosed and are thoroughly protected against dirt, oil and water, and ought not to be affected in any condition of operation.

There are three methods of regulating the voltage of the generators, these being the inherent regulation, the potential regulator control, and the third brush system. By the inherent method of regulation the battery charging current passes through the series windings of the reverse compound field, which prevents an overcharge at high speeds, and as the lighting current is drawn from the battery this tends to increase the voltage of the generator and the proportion of the load that it carries. The potential regulator control is by means of a vibrating contact that is controlled by the generator voltage, intermittently short circuiting a high resistance in series with the shunt field. This maintains a constant voltage regardless of the battery and affords a tapering charge. The regulator may be either self-contained with the generator or a separate unit located on the dash. The third brush regulation is by an extra brush that collects the shunt field current, which is so located that armature reaction prevents excessive voltage at high speeds. The generator circuit is "cut in" at a speed from 25 to 30 per cent. higher than at the speed it is "cut out," which insures against continually operating at critical speed.

(To Be Continued.)

BOSTON TRAFFIC ARRANGEMENTS.

BOSTON began at first of the year to try out a new system of traffic control. This system includes the use of traffic semaphores at busy street corners and painted aisles of safety marked on the pavement.

The adoption of this plan was brought about by committees from the various automobile clubs which have observed the operation of traffic systems in New York City and Detroit, and insisted upon Boston having similar regulations.

The bands of white paint on the pavements mark out what are called "dead lines," which form the limits of a zone through which pedestrians will be forced to pass from one side of the street to the other. Traffic is kept out of them when the stop signal is displayed on the semaphore.

The semaphores are different from those used in New York City in that they are operated by electricity and will bear red lights both day and night. If they prove successful they will be installed at all the busiest corners of the downtown streets.

The new traffic arrangements include an "anti-jay-walking" ordinance, which provides a fine of \$20 for pedestrians who cross the streets at any place except those indicated by the traffic police. Boston is the first city to pass an ordinance of this kind. The others have been held back by one of the fundamentals of the "bill of rights," which in most states provides that citizens can freely use their own highways and can go wherever they please at any time.

The necessity of such an arrangement for traffic control is, however, keenly felt by the police in nearly every city and the operation of the Boston ordinance will be watched with keen interest by police officials everywhere.

SHOWS BRAKE CABLE STRENGTH.

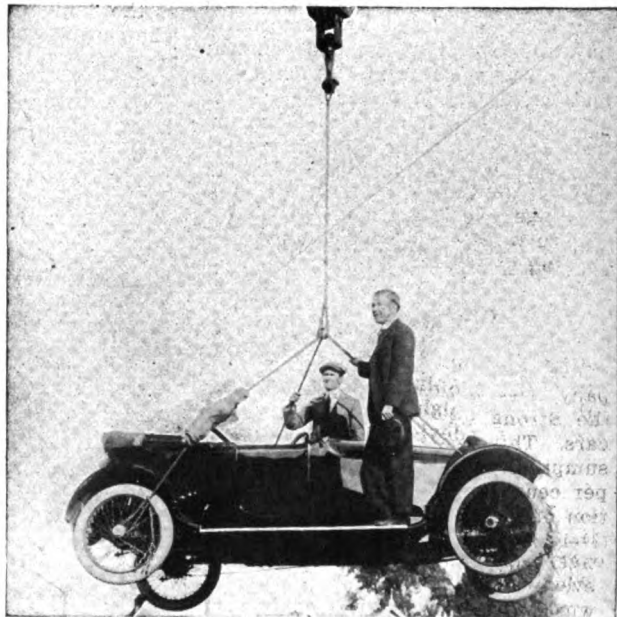
To prove to a customer who doubted the strength of the slender piano wire brake cables used on Scripps-Booth cars, Ralph C. Hamlin, Los Angeles dealer, recently used one of the cables in connection with a large crane to lift a whole car out of a freight car and place it on the ground. Two passengers were placed in the car to further test the cable. These cables, while very strong, look slighter than the rods that are usually used for braking purposes, and some buy-

ers will not believe that they are sufficiently strong until it is demonstrated.

AIR COOLING TO BE REVIVED.

F. W. Lanchester, one of the most prominent, as well as original and progressive of the English automobile engineers, recently delivered a paper before the Institute of Automobile Engineers on air cooling. His discussion is likely to have the effect of reviving air cooling, at least to the extent of causing additional experimental work upon it.

Although it is now used successfully on mo-



Demonstrating the Strength of the Scripps-Booth Car, and More Particularly of Its Piano Wire Brake Cable.

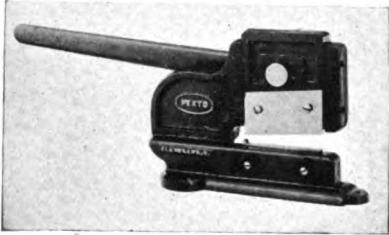
torcycles and aeroplanes, the principles employed are almost exactly the same as those used years ago when air cooling was abandoned by most motor car makers.

The system has very large advantages in cutting down the weight of the car and dispensing with much complication that is made necessary by water cooling. If it can be developed to the point where it will be equally efficient it would certainly become the standard motor car practise. The use of aluminum cylinders, which conduct heat more rapidly than cast iron, may have an influence on the movement.

CAR ACCESSORIES AND EQUIPMENT.

BRAKE LINING CUTTER.

The Pexto cutter, which is manufactured by the Peck, Stow and Wil-



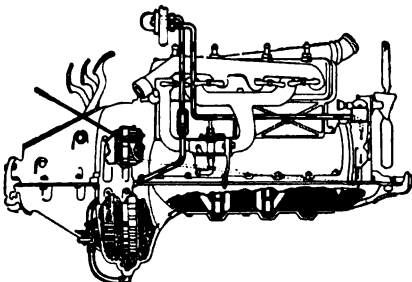
cox Company, Cleveland, O., is designed to cut through brake lining of $\frac{3}{8}$ -inch thickness as easily as "a knife cuts butter." This ease of cutting is accomplished by an eccentric knife of special design and construction. The machine is 18 inches long and weighs but 17 pounds.

Composition fabrics that are difficult to cut by other means are easily handled by this machine. Leather, canvas and other specially prepared beltings are among the materials to which it is successfully adapted. The selling price is \$10.

SIGHT FEED OILER.

The Perkins Manufacturing Company, Des Moines, Ia., manufactures the Strong sight feed oiler for Ford cars. This device will reduce the consumption of oil by approximately 50 per cent. It insures adequate lubrication of motor by moving the oil positively at the rate of one-half gallon to every thousand revolution of motor, which is sufficient under normal circumstances to keep the components cool and still does not permit excessive burning of the oil.

The construction includes a connec-



tion between the lower petcock and the plug at the bottom of the crank case that insures a substantial reserve supply of oil, which can be drawn

upon when needed. Another notable feature is the connection of the pump with a rocker arm, which is raised by the valve travel.

The Strong sight feed oiler is guaranteed for the life of the car on which it is installed, and it can be attached very quickly and without making changes in the engine. It is priced at \$5 complete.

THE ACORN UNI-LITE.

The Acorn Brass Manufacturing Company, 426 South Clinton street, Chicago, Ill., is the manufacturer of the Acorn uni-lite shown in the accompanying illustration. It is described as the "universal light for everyone." The capacity of the bowl is one quart of gasoline or kerosene, the former be-



ing preferable, and one filling is sufficient for 15 hours' continuous burning, or at a rate of 60 hours to the gallon.

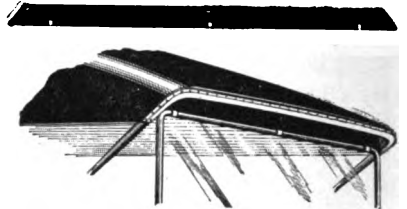
The projecting hood or reflector protects the light while being used outside and also concentrates the light at the right place for reading and general indoor use. Statement is made that the lamp will burn in any position and even if it is knocked over or rolled on the ground while lighted it will not explode.

The chimney is made of mica and will not crack or break when used in rain, snow or cold.

It is estimated that about 300 candle-power is produced by the light, which is approximately 20 times that of the common lantern. The retail price is \$9.

MONARCH ANTI-DRAFT SHIELD.

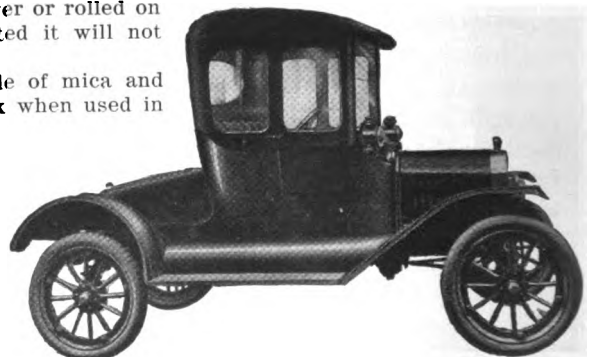
The Monarch anti-draft shield illustrated herewith and manufactured by



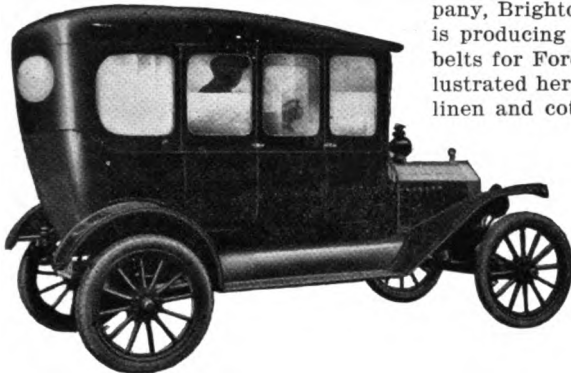
the Monarch Carriage Goods Company, Cincinnati, O., is designed to seal the space between the top of the windshield and the top of the Ford car. It fastens to the top of the windshield with clamps and to the top with fasteners. Attachment to the car is simple, a screw driver being the only tool needed. It is made to fit all 1914 and 1915 touring and runabout models.

SEDAN AND COUPE TOPS.

The Anchor Buggy Company, Cincinnati, O., for almost 30 years a manufacturer of vehicles and vehicle parts, is producing the Anchor sedan top for the Ford touring car and the coupe top for the roadster. These tops are shown herewith. They can be easily and quickly attached to the regular body. The roof, back and panels are made of wood and covered with a high-grade of upholstering material. All windows, including the oval pane in the rear, are of glass. The interior is neatly trimmed with attractive light colored whipcord. A single locking device allows the doors in the top and those in the car to be opened as a single unit. When added ventilation is needed in moderate weather the windows may be let down. The doors and side windows may be



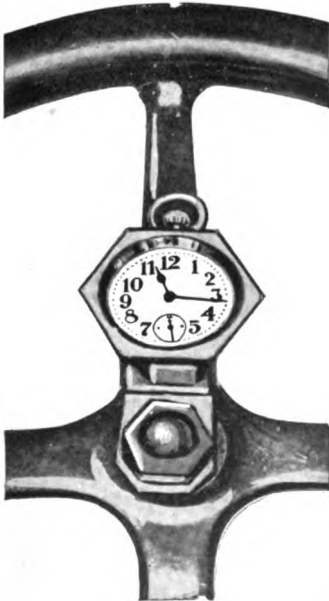
removed readily and the regular curtains substituted. These tops combine light weight, strong construction,



attractive lines and excellent finish. The sedan top complete for the touring car sells at \$57.50; the coupe top for the roadster is listed at \$47.50.

STEERING WHEEL CLOCK.

The Troy Auto Clock Company, Troy, O., is the manufacturer of the 30-hour, stem wind Troy steering wheel clock illustrated herewith. It is adapted to Ford, Maxwell, Dodge, Grant and other cars that have the spark and throttle levers under the wheel. It is a high-grade movement auto clock and is built to withstand severe vibration. Attachment to the car is simple. Remove the nut on top of the steering rod, slip the clock holder on, and replace the nut. The two projecting arms are then bent



around the spoke of the wheel. Further details on request. Sold complete at \$2.50 each.

ENDLESS FAN BELT.

The Fairmount Manufacturing Company, Brighton Station, Cincinnati, O., is producing "Fairmanco" endless fan belts for Ford cars, one of which is illustrated herewith. They are made of linen and cotton fabric and folded together by special machinery. A four-ply endless belt is formed and then stitched with five rows of linen thread. Each belt is thoroughly stretched and treated by a secret process to make it impervious to shrinkage, oil, heat, water and stretch. The finished product is guaranteed by the maker to be 50 per cent. stronger than a leather belt of twice the thickness.



List price, 25 cents each.

LAPPING COMPOUND.

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not possibly do the motor harm. This process is not an experiment. It is now being used by many of the



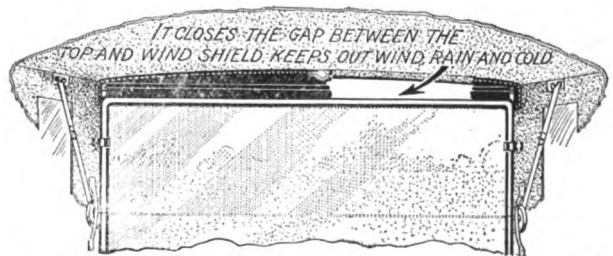
largest manufacturers. Complete information supplied to those who mention this publication when writing.

PROPER LUBRICATION.

In the matter of lubricating the various components of the automobile, many operators do not properly understand the kind and quantity of lubricant to use for each part, nor the frequency with which it should be applied. A valuable booklet on the subject has just been issued by the Joseph Dixon Crucible Company, Jersey City, N. J., and will be sent free upon request to those who mention this magazine.

THE LIMOUS'ETTE.

The Lion Buggy Company, Cincinnati, O., is the manufacturer of the limous'ette for Ford cars shown in the accompanying illustration. It is designed to fill the space between the windshield and car top and thus keep out the rain, wind and cold. The device can be attached in an instant and can be quickly adjusted to fill the gap. An important feature is that the limous'ette does not fasten to the auto top, which allows the upper part of the windshield to be turned back. It is made of imitation patent leather,



thoroughly reinforced. The brackets are drop forgings. The complete attachment lists at \$1.50 each.

PRACTICAL FACTS FOR NEW CAR OWNERS.

Elementary Instructions in the Economical Operation, Maintenance, Adjustment and Repair of the Ignition System—Answers to Inquiries.

AS WAS explained in the preceding installment, the space between the poles of a magnet is known as the magnetic field. If a wire be moved through this field so as to interrupt the lines of force there will be an electric current induced in the wire. This principle is illustrated in Fig. 2, wherein is shown an elementary type of magneto.

It is found that by moving the wire across the lines of force in the opposite direction, the flow of the current produced in the wire is reversed. This wire is formed in the shape of a rectangle and is so arranged as to rotate between the poles of the magnet. It should be noted, however, that there is absolutely no frictional engagement of any kind. If a measuring instrument connected the ends of the wire and the wire rotated, it would be found that an electric current

and the influence must pass through in the manner indicated. At C the armature has completed a half revolution and the magnetic energy abandons the longer path through the body of the core. On further rotation, as at D, the body of the core again becomes energized as the magnetic influence resumes its flow through it.

These changes in the strength of the magnetic field thrown out by the armature core, as well as the intensity of the energy existing in the field, affect the windings. The electrical energy induced in the windings corresponds in strength to the rapidity of rotation. It is obvious that the greatest change in strength occurs when the armature passes from the position illustrated at B to the position shown at D, as the magnetic field existing around the core will be destroyed and again re-established.

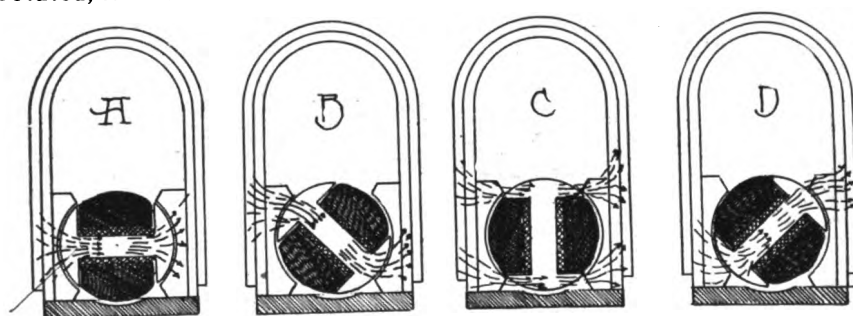


Fig. 1—Illustrating the Magnetic Flow When Armature Is at Different Positions.

would flow out of one end of the wire and into the other. This is termed an alternating current because its direction of flow is changed each time the wire turns over.

In the practical magneto used for ignition purposes instead of having only a single turn of wire for an armature there are a great many turns of wire wound round a piece of soft iron. This coil, like the single turn of wire, is rotated between the magnetic poles, and by cutting the lines of force a current is produced in the windings. Fig. 1 illustrates the magnetic flow when the armature is at different positions.

When the armature is in the horizontal position shown at A, the magnetic flow is through the main body in a straight line. At B the armature has attained approximately 45 degrees of travel

and the influence must pass through in the manner indicated. At C the armature has completed a half revolution and the magnetic energy abandons the longer path through the body of the core. On further rotation, as at D, the body of the core again becomes energized as the magnetic influence resumes its flow through it.

During the greater part of the cycle of rotation the variation of strength will be slight. As the armature leaves the position shown at C and turns to the position illustrated at D, the core again becomes remagnetized and it is at this time that the current induced in the windings will be at maximum strength. For this reason it is im-

perative that the armature be driven in such relation to the crankshaft so that the fuel mixture in one of the cylinders will be in a condition to be ignited. This condition exists twice during each complete revolution of the armature.

Magnetos are said to be either of low or high-tension. The low-tension type delivers a current of low voltage, which must be stepped up to one of higher voltage before it can be used for ignition purposes. This is done by a transformer coil, usually located on the dash of the machine. In the low-tension type of magneto, the armature contains only a primary winding and the transformer coil has both primary and secondary windings.

The high-tension magneto requires no transformer coil. It will deliver a current of suf-

ficiently high voltage for ignition purposes. The armature of the high-tension magneto has two windings, one primary and the other secondary. The arrangement of these windings can be readily ascertained by again referring to Fig. 1. The primary winding is a comparatively coarse wire. One end is grounded to the armature core and the other passes to the insulated part of the interrupter, as shown in Fig. 2. This sketch is merely inserted to illustrate the principle. It is common practise for the breaker mechanism not to revolve, the desired motion being obtained by a revolving cam. This construction would require the use of brushes to make the connection.

During the revolution of the armature the grounded lever makes and breaks contact with the insulated point, thus short circuiting the primary winding upon itself until the armature reaches the correct position to produce a current of maximum intensity. At this time the circuit is

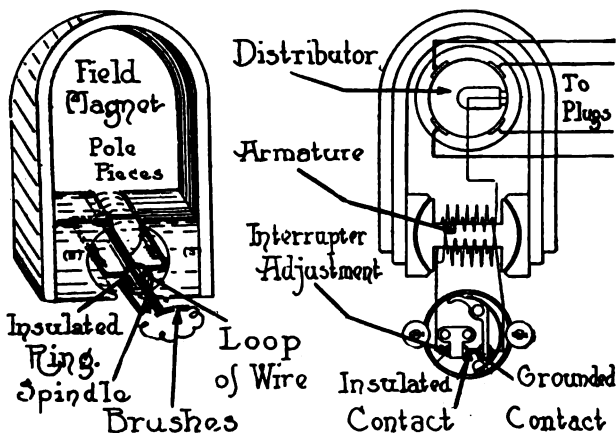


FIG. 2—At Left, Sketch of Elementary Magneto, Showing How Flow of Current Is Reversed; at Right, Illustration of Action of True High-Tension Magneto.

broken. One end of the secondary, or fine, wire is grounded on the live end of the primary and the other end is attached to the revolving arm of the distributor mechanism.

A summary of the action is as follows: As long as a closed circuit is maintained feeble currents will pass through the primary winding and while the contact points are together this condition will exist. When the armature has reached the position to produce a current of maximum value, the contact points are separated, which results in breaking the short circuit that has existed in the primary winding. When the interrupter operates, the maximum primary current is diverted from its short circuit and can flow to the ground only through the secondary winding and spark plug circuit. The current produced in the secondary winding is of high enough potential to

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jump the air gap at the plug and thus produce a spark to ignite the compressed mixture in the cylinder.

The true high-tension magneto should not be confused with magnetos that have the coil placed on top of the instrument, instead of in the dash. This arrangement is not typical of a high-tension magneto, as the transformer coil is simply placed there for the sake of convenience.

Magnetos can be divided into two general groups, armature and inductor types. The armature type is one in which the lines of force are cut by a coil of wire wound on an armature revolving between the magnetic poles. As previously stated, it can be either of the low or high-tension type.

The coil of wire is stationary in the inductor type of magneto. The cutting of the lines of force is accomplished by a revolving inductor.

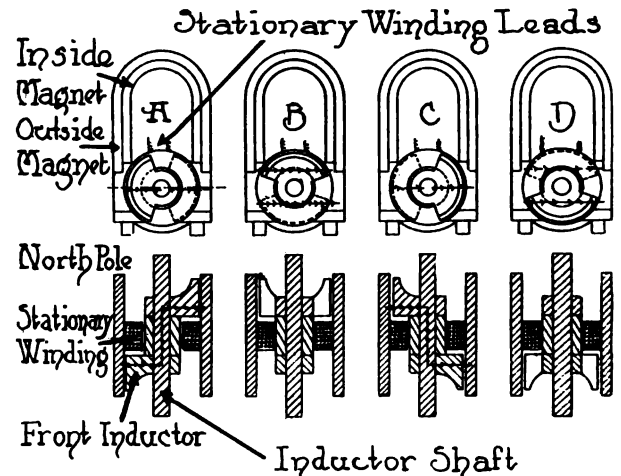


Fig. 3—Principles of Operation of the Inductor Type of Magneto.

Two inductors are mounted on the shaft and rotate with it. The current is generated in the stationary coil. This construction does not require the use of sliding contacts and brushes to establish a connection between the coil and the external circuit.

The principles of operation of the inductor type of magneto are shown in Fig. 3. At A the front inductor is near the pole piece N and the rear inductor is close to the pole piece S. When in this position, the shaft and core form an iron path between the inductors. The magnetism thus passes from the pole piece N to the front inductor through the core and shaft to the rear inductor and thence to the pole piece S. It will be noticed that the current in this instance passes from the front to the back. When the inductors are in the position illustrated at B each forms a path be-

tween the pole pieces N and S.

The magnetic force does not pass through the coil, because the inductor assembly affords a shorter direct path. When in position C, the conditions are similar to those shown at A, except that the flow is reversed, it passing through the coil from the back to the front. When the parts are in the position shown at D the same effect is obtained as when in position B. The only difference is that the front inductor is down and the back one up. The magnetic force does not pass through the coil when the inductors are in this position.

READERS' QUERIES.

Castor Oil In Stock Cars, How To Prevent Lubricant from Leaking, Kerosene As a Cooling Agent, Operation and Construction of Hand Horn, Restoring Corrugated Surface of Brake Pedals.

Use of Castor Oil—G. B., San Diego, Cal.

It is often said that castor oil is a much better lubricant than the oils now commonly used. This statement seems to be substantiated by the fact that castor oil is used in racing cars, where thorough lubrication is essential. Why is it then that this lubricant has not been adapted to the stock cars?

The greatest objection to castor oil, even if it could be used successfully in the stock car, is its high cost. The fact remains that castor oil is not adapted for use in the engine of the ordinary stock car. The reason for this is that it is a vegetable product and has a much greater viscosity than the ordinary lubricant. This lubricant also has a tendency to gum and in the slow running motor would cause "freezing" of the pistons. Another reason for its use in the racing motor is that because of its viscosity at high temperatures, it prevents the gases from leaking by the piston rings. Castor oil will also cause carbonization of the cylinders quicker than the ordinary lubricating oil. The general opinion of automobile engineers is that the oil is especially advantageous under extreme heat conditions, but less advantageous than the commonly used mineral oil when used in the ordinary stock car motor.

Noisy Gears—B. K. A., Bath, Me.

The differential gears in my car give off a great deal of noise when operated. A loud humming noise was noticeable before I had it overhauled by a repair man. Since then the noise has changed to a grinding sound. Can you suggest what the trouble might be?

It would appear that before the gears were

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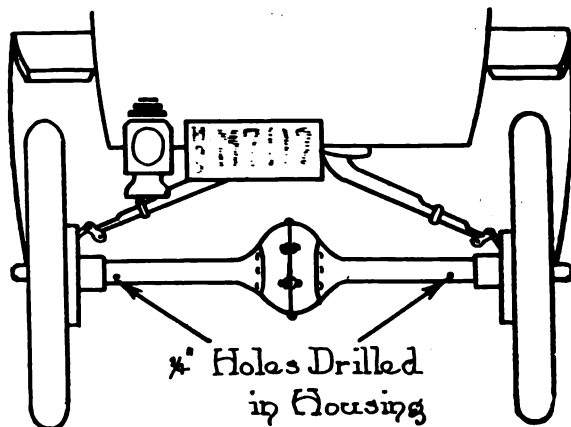
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overhauled they were too loose and when they were adjusted they were set too tight. This would account for the different sounds produced. If the gears are much worn it will be a practical impossibility to obtain silent operation with them. However, if the gears were adjusted by a competent repairman he may have purposely set them too tight, in which case they will soon wear in so that smooth operation will be the result.

Lubricant Leaks Out—B. D. L., Attleboro, Mass.

Although I frequently remove the rear wheels and wash the brake bands and drums with kerosene, it is impossible to prevent the grease from being thrown on the tires. I have fitted new felt washers and noted an improvement for a while. The repair was but temporary, however, and at present the condition is the same as before. Can you suggest any method that will overcome this trouble?

It may be advisable to try using a smaller amount of lubricant. If this does not produce the desired result, try the remedy shown in the ac-



Providing Exits for Surplus Lubricant.

companying illustration, which is one that has been used by several owners with good results. Quarter-inch holes should be drilled in the axle housings, so as to face at a point between the road and direct rear of the car. These holes form an exit for the pressure produced by the revolving of the mechanism. Metal plugs can easily be fitted should it ever be desired to seal the holes.

Truck Overheats—T. S., Providence, R. I.

I have a five-ton truck that travels daily a distance of about 16 miles. The start of the trip is mostly uphill, and lately my truck cannot reach the top of these grades without overheating. The cylinders are free from carbon and the engine has plenty of power. I have tried taking the hills on high and also on low speeds, but the result is always the same. I have checked the timing and find it to be O. K. Can you suggest where the trouble may be located?

It is advisable to thoroughly overhaul the cooling system. Starting with the radiator, prod out all mud and other matter that has settled be-

tween the vertical cooling tubes. Next examine the water pump to determine that the propeller wheel is securely fastened to the shaft. It may also be well to thoroughly clean the cooling system; a solution of soda and water will remove much of the rust. The next member to be examined is the fan. If any of the blades are bent, they should be straightened. On several heavy trucks the fan is one of the chief factors in cooling the motor. It is imperative therefore that the belt be kept tight so that the fan will be driven at full speed. If it has a tendency to slip, apply belt dressing to the inner surface. The truck mentioned in your letter has no louvres in the hood. If in the future trouble is experienced on the grades, the cooling can be greatly assisted by operating the car with one side of the hood raised, as shown in the accompanying illustration. This affords a ready exit for the heat and also permits cool air to circulate about the engine.

Kerosene in the Radiator—H. N. H., Riverpoint, R. I.



Cooling a Truck Motor by Raising One Side of the Hood.

Will you kindly advise me whether kerosene would be detrimental to the cooling system if mixed with water? I am told that it will prevent water from freezing.

There is no good reason to believe that kerosene would effect the cooling system. However, it is not advisable to use it for cooling purposes, because it has practically no value as a non-freezing solution unless used in large proportions. Denatured alcohol or glycerin would be far more efficient and much cheaper.

Hand Horn—W. S., Southampton, Mass.

I notice that the tone of the hand horn on my car is becoming less penetrating than when I bought it a year ago. What is the cause of this and how can I remedy the trouble?

While you fail to mention the name of the maker of the particular warning signal you write about, you no doubt can follow the sense of the explanation by examining the accompanying

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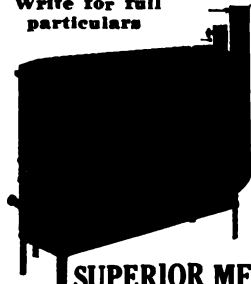
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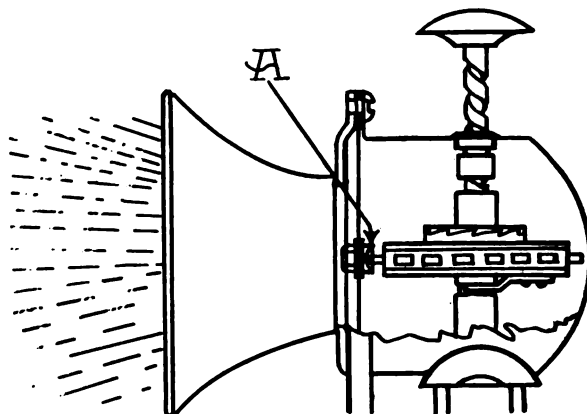
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sketch. As you probably know, the principle of construction and operation does not vary greatly in any of the makes on the market.

This horn includes a steel diaphragm, or sounding board, which is actuated by being struck by a revolving disc on which are steel projections. This disc is operated either directly or through gears when the plunger is depressed. In the centre of the diaphragm is a steel nipple, against which the knobs on the disc strike. After long service this nipple is liable to wear down, so that one or more of the knobs will not strike it. This probably is the trouble with your horn.

The only practical remedy is to have the nipple replaced. If a new one cannot be obtained readily, file a stove bolt head to a sharp edge, as shown at A, and cut off the shank of the bolt to the right length. Harden the remainder of the bolt and screw it into the diaphragm.

Standard Tire Sizes—G. J. K., Newark, N. J.
Can you supply me with a list of tire sizes that are



Constructional Details of the Average Type of Hand Operated Warning Signal.

recognized as standard? Who drew up the list?

At one time there were as many as 51 different sizes of tires made by one company, which was one of the reasons why tires at that time cost more than they do at present. As a consequence the tire industry was in a rather chaotic condition generally, until the tire manufacturers and the Society of Automobile Engineers got together and evolved the following S. A. E. standard list, which consists of nine standard sizes and an equal number of oversize profiles to correspond.

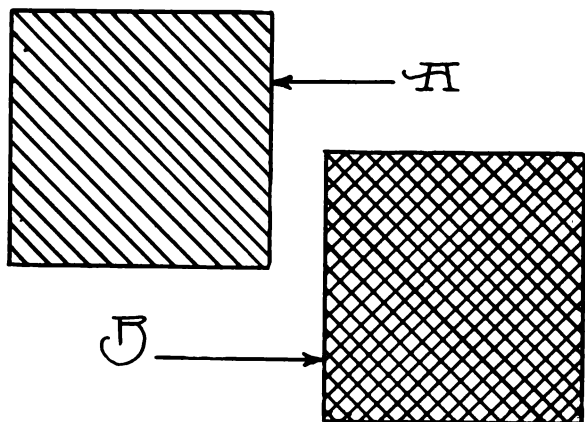
Standard	Oversize
30x3 inches	31x3 1/2 inches
30x3 1/2 inches	31x4 inches
32x3 1/2 inches	33x4 inches
32x4 inches	33x4 1/2 inches
34x4 inches	35x4 1/2 inches
34x4 1/2 inches	35x5 inches
36x4 1/2 inches	37x5 inches
36x5 inches	37x5 1/2 inches
38x5 1/2 inches	39x6 inches

This standardization has been found to greatly simplify the manufacture and distribution of tires and to materially reduce the cost to the consumer.

Pedals Worn Smooth—B. J. T., Woonsocket, R. I.

The clutch and brake pedals of my car have square metal surfaces. The sharp projections have worn off and in rainy weather there is a tendency for the feet to slip. I have placed rubber pads on the pedals, but these soon wear smooth. Can you suggest any method of affording a positive foot grip on the surfaces?

There are numerous non-slip rubber pads on the market that can be purchased for a nominal sum. These clamp to the pedals. If you have tried any of these and found them unsatisfactory, it would be advisable to remove the pedals, place them in a vise and file corrugations on their surfaces. A small three-cornered file is the best adapted for this work. Using the corner of the file, grooves of about 1/16 inch in depth and 1/8 inch apart should be filed on a 45-degree angle, as shown at A in the accompanying illustration. The



How Corrugations Should Be Cut on Brake and Clutch Pedals.

cut should then be made from the other corners, as shown at B. This operation will result in a surface that will afford the desired foot purchase.

Climbing Steep Grades—B. S., Harrisville, R. I.

I have a ——— truck of 3000 pounds capacity. It operates well on the level, but there is a tendency to miss and backfire when climbing grades. The carburetor and the intake manifold do not overheat. By the advice of friends I replaced the old manifold with one that is three inches shorter. I noticed an improvement while operating on level surfaces, but cannot understand why the backfiring continues when driving up grades. The chambers of the carburetor are thoroughly clean and the compression in the cylinders is good. Any helpful suggestion will be much appreciated.

In the truck you mention, the feed of fuel from the tank to the carburetor is by the gravity system. By shortening the intake manifold you have raised the carburetor and consequently on grades the gravity action is almost defeated. The back-

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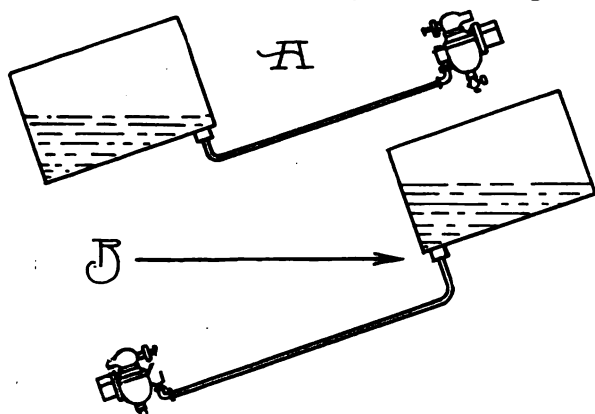
Send ten cents today for a sample can, large enough to polish an entire car. This sum just covers the cost of postage. A trial will demonstrate that Victrolene is what you want and need.

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Always insist on Victrolene when buying. The matchless guaranteed car polish and cleanser.

firing is due to the fact that the supply of fuel is not enough to meet the requirements of the motor. The remedy for this is either to elevate the fuel tank a trifle or to lengthen the manifold. However, if the trouble appears only on very steep grades and the necessity to climb the grades



Illustrating Why Fuel Does Not Flow Properly on Steep Grades, and a Simple Way by Which to Overcome It.

is not frequent enough to prove a decided inconvenience, you could continue to operate it in its present condition by simply driving up those grades with the truck reversed.

The accompanying sketch A illustrates the ef-

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fect upon the fuel in the gravity system, or rather its flow to the carburetor, under the conditions mentioned in your query. When the truck is reversed the condition represented by sketch B is achieved, this having the effect of making a positive gravity flow. This suggestion may also be helpful to you when the car is overloaded and the route leads over steep grades. The reverse gear is generally of a higher ratio than the low speed gear and consequently more power can be obtained.

Specific Gravity—G. T. S., Moonup, Conn.

In several previous issues of your journal I have noticed that specific gravity is often referred to. What is specific gravity and how is it determined?

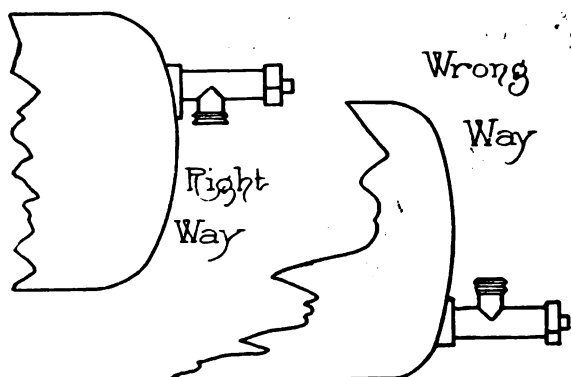
The definition of specific gravity is the weight of any substance as compared to the weight of water. Water is always designated by the standard, 1. As an example, consider aluminum, which is perhaps the lightest metal used for commercial purposes. The weight of this metal is a trifle greater than $2\frac{1}{2}$ times that of water and its specific gravity is listed as 2.56. The specific gravity of a liquid is usually determined by an instrument termed a hydrometer. This is a glass tube that is weighted at one end. When this is placed in the fluid to be tested the surface line on

the tube is determined by the weight of the liquid. The specific gravity is then shown by a scale enclosed in the hydrometer. Should the instrument be placed in fresh water the mark 1.00 would be visible at the surface of the liquid. Should it be placed in salt water, however, it would not sink so deeply, because the water contains salt and is naturally heavier. The instrument is valuable in several ways, such as for testing the specific gravity of electrolyte used in storage batteries, gasoline, etc.

Position of Acetylene Tank—F. R. Foster, R. I.

To settle a discussion, will you state if there is a right and wrong method of attaching the acetylene tank to the car? A states that the tank should be so located as to place the valve in the uppermost position, while B states that the valve can be placed in any position.

The method suggested by A is the one recommended by the Prest-O-Lite Company, Inc., one of the world's largest producers of dissolved acetylene. The reason for placing the valve in the



Right and Wrong Position of Valve of Acetylene Tank.

uppermost position is that a free and unobstructed flow of gas is maintained. The gas is stored with a liquid chemical and when the valve is placed at the bottom, there is a likelihood of the chemical escaping into the pipe line, checking the flow of gas and discoloring the flame. The right and wrong methods of attaching the tank to the car are shown in the accompanying illustration.

VALUE OF INDELIBLE PENCIL.

An indelible pencil is a valuable asset to the equipment of any tire repair outfit. When on the road and a puncture occurs, the hole can usually be found at a glance by the operator. By marking the imperfect part of the tire with the indelible pencil, the puncture can be quickly located when it is desired to make the repair.

(When Writing to Advertisers, Please Mention The Automobile Journal.)

No More Ignition Troubles—

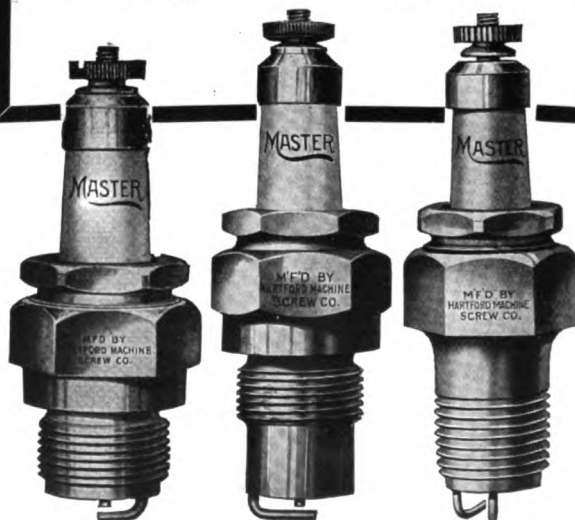
Stop that excessive waste of gas and current—stop experimenting with cheaply-built, easily breakable spark plugs that cause endless trouble and expense. Get more power and speed—enjoy long, efficient, care-free ignition service by equipping your engine with the quality spark plugs of the world—MASTERS!—the plugs that insure swift, uniform, thorough combustion.

MASTER SPARK PLUGS

—represent the utmost in scientific spark plug construction. Will not break, soot or leak gas. Strong—substantial—easily cleaned. So simple they can be easily taken apart and put together with no resulting injury.

There is a MASTER to suit every make of car—one that will give you unheard of spark plug satisfaction. Try a set on our "30 days' money-back" guarantee.

**Your Dealer Can Supply You, or Send Direct to
Hartford Machine Screw Co.
515 Capitol Ave., Hartford, Conn.**



MASTER

Regular Length
\$1.00 Each

MASTER

Extra Long
\$1.25 Each

MASTER

Model F, designed
especially for Ford
Cars, \$1.25 Each.

A Complete Library of Automobile Mechanics **\$4.75**

Transportation Charges Prepaid

Distinct Books—1000 Pages of Text—All Copies Indexed—2000 Illustrations, Including Practical Working Page Charts and Trouble Finders.

Books written by recognized authorities. Especially prepared for those who have to do with the sale, care, repair and operation of motor vehicles, their parts, equipment, accessories, etc.

The practical information in these works cannot be secured through any other series or number of books or for 50 times what is charged for this library.



Engine . . .	35c	Chassis . . .	25c
Magneto . . .	35c	Lighting . . .	50c
Carburetor . . .	35c	Operation . . .	50c
Battery . . .	35c	Overhauling . . .	50c
Tires . . .	25c	Motorcycle . . .	35c
Truck Operation		\$1.00	


Automobile Journal Publishing Company

Times Building

Pawtucket, R. I.

ZENITH

PRECISION



GOOD carburetion requires the utmost precision. There is one best proportion of gasoline and air that must be maintained under all conditions of speed and load. Any departure from that one best proportion is detrimental—short measure or long measure are equally bad.

The simple, rigid Zenith measures accurately the air and the gasoline under all conditions of speed and load. This precision is attained through a measured venturi tube and the famous compound nozzle of the Zenith. There are no air valves depending upon unreliable spring action—no dashpot to gather grains of dust and stick. There are no cams or valves to lend complication—no adjustments to be thrown out of order by the inquisitive novice and make precision results impossible. The Zenith, once properly installed, gives unfailing uniform service without thought or attention.

This result, exclusively Zenith, is the ideal of carburetion on touring car or truck.

That it is widely recognized as such has long been proved in Europe where Zenith dominates the market. The Zenith offers much and gives more. It is built on basic principles treating fundamentally the problem of good carburetion. It is exclusive and fully protected but always at the service of the motor manufacturer and public.

CARBURETOR
DETROIT—U.S.A.

REFH

DELCO

ELECTRIC CRANKING LIGHTING IGNITION

President's Office
 To Mr. J. G. Vincent,
 Vice. Pres. of Engineering Department
 Subject: Packard Twin-Six Ignition

June 25, 1915.

I want to comment on Packard ignition as it is on the Twin Six which I have just driven to San Francisco from the factory.

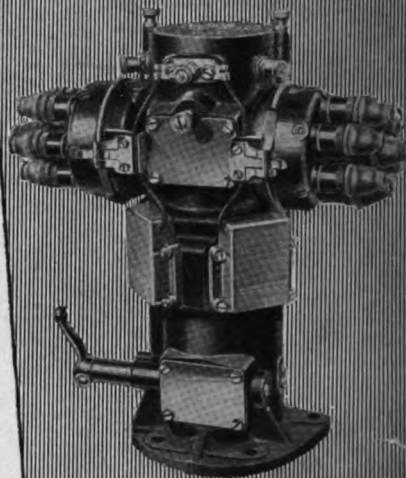
On the 22nd day after I left the factory I arrived in San Francisco. Ordinarily I make the trip in 15 days. Notwithstanding the very great improvement in the road conditions along the Lincoln Way accomplished within the past two years, the journey took 22 days on account of the rainy weather which had prevailed throughout Illinois, Iowa and Nebraska. It took me 14 days to get from the factory to Cheyenne and 12 of those days it rained this on top of continuous rains which had prevailed throughout that district. Those mud roads were something almost hopeless. Many bridges were out, river bottoms were flooded, and the immense amount of new grade work on the Lincoln Highway which had not yet had time to pack down was almost bottomless mud. Motor car travel, and even horse travel, were almost entirely suspended.

I was on the lookout for ignition trouble on account of repeated showers of muddy spray which drenched the motor. But no miss occurred. Finally our radiator became so clogged up with mud that the car was badly overheating and we had to stop by a roadside ditch and with our canvas buckets dash water on the radiator to clean out the packed mud which filled it. In doing so we necessarily thoroughly wet down the motor, the wiring, and everything else. In fact, we threw bucket after bucket of water on the front end of the motor and the ignition itself to get it so it was visible at all.

We felt that we were hopelessly stuck, and would have to wait until the rain ceased and the motor dried out. I pressed the cranking button just to see if it would go at all. To my amazement, the engine started without a miss and we proceeded on our journey. Our confidence was restored and thereafter we stopped frequently and kept the radiator cleared of mud because we had no fear of ignition troubles.

The wonderful progress which has been made in developing this type of ignition in the last two years is astonishing. It seems to me absolute perfection, and it is entirely fitted to our high speed Twin-Six motor. On the entire trip not once did we touch the ignition. We did not touch a spark plug. We did not make an adjustment of the make and break points. And yet we traveled well over 1,000 miles on first and second speed. The new type of generator ignition is certainly far beyond anything I had hoped for. I cannot say that it is more waterproof than any other ignition I have ever had experience with. But I can say that it is waterproof.

Henry B. Joy.



**DELCO
 IGNITION
 BUILT FOR
 THE NEW
 PACKARD
 "TWIN SIX"**

THE document shown above is a fac-simile of an office memorandum—an official report—written by Henry B. Joy, President of the Packard Motor Car Company, to J. G. Vincent, Vice-President of Engineering of the Packard Motor Car Company. Mr. Joy has just returned from a trans-continental tour in a Packard "Twin Six," equipped with a Delco ignition system, which in this remarkable trip was deliberately subjected by Mr. Joy, to the severest possible road conditions and the most crucial test.

This is not a testimonial. It is a field-report of the President of one of America's greatest manufacturing institutions, the President of the Lincoln Highway Association, the man who has made more coast-to-coast motor trips than any other individual, the man who typifies luxurious American touring, written to his engineering lieutenant purely in the cause of Packard efficiency and scientific progress.

The Packard-Delco ignition system, that won this extraordinary tribute from President Joy, is the achievement of scientific co-operation. Packard engineers and Delco engineers worked in closest harmony to accomplish this result. Such unison in design and harmony in accomplishment characterize all Delco Equipments.

The Dayton Engineering Laboratories Company, Dayton, Ohio

VOL. XL.

NO. 2.

AUTOMOBILE JOURNAL

\$1.50 the year
10 cents the copy

PAWTUCKET R.I.

Aug. 25, 1915

THE NEW SERIES

Genemotor

Trade Mark

THE General Electric Company announces a New Series Genemotor, now ready for delivery.

It is much more efficient than the original model, which attained leadership in 90 days.

Two important new features—a double-point contact relay and a flexible driving pinion—establish the New Series Genemotor on a new basis of supremacy.

They provide against the misuse of the Genemotor in the hands of the novice and make doubly sure long and continuous service.

To the big distributor or to the small dealer the New Series Genemotor now means a big Fall season, particularly in view of the new conquest of the Genemotor in winning

THE GOLD MEDAL

At the Panama-Pacific International Exposition

This is a distinction which has an important bearing on sales, for all the world loves a winner.

A merchant anywhere, they say, is known by the goods he sells. Why not sell the best?

If you are not now handling the Genemotor, please write us.

A·J·PICARD & CO

1720-1722 BROADWAY, NEW YORK

BOICE-PERRINE COMPANY
Boston, Mass. New England Distributors

That Six—Eight or Twelve Cylinder Car—



MASTER
Extra Long
\$1.25 Each



MASTER
Regular Length
\$1.00 Each

would be a mere heap of junk if the engine had no Spark Plug.

Almost as bad if the plugs in the engine do not measure up to the demands made on them.

MASTER SPARK PLUGS

are designed with ample insulating surface to allow for the extreme expansion and contraction which is bound to take place in plugs in the big many cylinder engines.

Experts tell us there's a lot more heat in six, eight and twelve cylinders than in four cylinders.

The ignition system in sixes, eights and twelves is much more complicated than in fours.

Play Safe—Use

MASTER SPARK PLUGS

and eliminate the chance of trouble. Even if every one of the 12 cylinders should get hot—

The Master insulator won't break in service.

Even if the compression is high—

The Master won't leak compression or gas.

Even if it takes a lot of oil to lubricate a six, eight or twelve—

The Master won't soot—or carbonize.

The Master is the ideal Plug for the new engines—tested for them, proven, adapted to them.

Dealers should fortify themselves against dissatisfaction by recommending Masters to their customers who own sixes, eights and twelves.

Manufacturers should insure their cus-

tomers continued good-will by providing **Quality Masters** as standard equipment. Let the service begin at the Factory.

Car owners of sixes, eights and twelves should specify **Master Spark Plugs—The Quality Plugs**—as equipment in these new wonderful quality engines.

The character and quality of these engines demand

The Quality Spark Plug THE MASTER

Master Spark Plugs will Give just as long, satisfactory, consistent service in six, eight, or twelve cylinder high speed engines under the heat conditions which develop in motors of this type as in engines of four cylinders which have less tendency to extreme heat.

Not only in Racing Cars—
—but in every motor car—
—under every kind of condition—

The Master will prove itself constant and unfailing in its action.

—Positive always and free from defects or faults of any kind.

GUARANTEE

"After using Master Spark Plugs for 30 days, if you are not entirely satisfied with your purchase, money will be refunded if requested on return of plugs where purchased—not only shows our confidence in the Master, but indicates our determination to stand back of every plug sold by us."

Ask us to prove our claims made for the Master.

Manufactured and Guaranteed by

**HARTFORD MACHINE
SCREW CO.**

512 Capitol Ave., HARTFORD, CONN.

VOL. XL.

NO. 3.

AUTOMOBILE JOURNAL

\$1.50 the year
10 cents the copy

PAWTUCKET R.I.

Sept. 10, 1915

Alive with POWER

MORE and more, motorists are coming to demand the exhilaration of driving a car, which, day after day, is fairly "tugging" with power.

And they are fast learning that power is more than a matter of correct mechanical adjustment.

If the fuel charge escapes down past the piston rings during the compression stroke, power plainly goes to waste. If, on the power stroke, the force of the expanding gases escapes past the piston rings, power again goes to waste.

Piston clearances vary in different types of motor. You cannot secure full power unless you maintain a proper piston seal. This demands an oil whose body is suited to the piston clearance in your motor.

Again :

The average motor has some 1500 parts—most of them moving. Different types of lubricating systems are used to carry oil to these parts.

Unless the oil you use is

In buying Gargoyle Mobiloils from your dealer, it is safest to purchase in original packages. Look for the red gargoyle on the container. For information, kindly address any inquiry to our nearest office

Gargoyle Mobiloil "A"
Gargoyle Mobiloil "B"

adapted to the feed system of your motor, incomplete lubrication of some parts must result. Friction follows. Power suffers.

So a very important demand of full power is high quality oil of correct body for your motor.

Our chart of Automobile Recommendations for years has been the motorist's standard guide to scientific lubrication. There you will find listed the correct oil for your car.

The complete Chart will be sent on request.

After you have cleaned out your motor and filled the crankcase with the grade of Gargoyle Mobiloils specified for your car, you will discover what full power means.

You will *feel* this power the moment you open the throttle.

Try it on a familiar hill.

If power is what you want, you should stop guessing about your lubricating oil and act on the scientific advice furnished in our Chart of Automobile Recommendations.



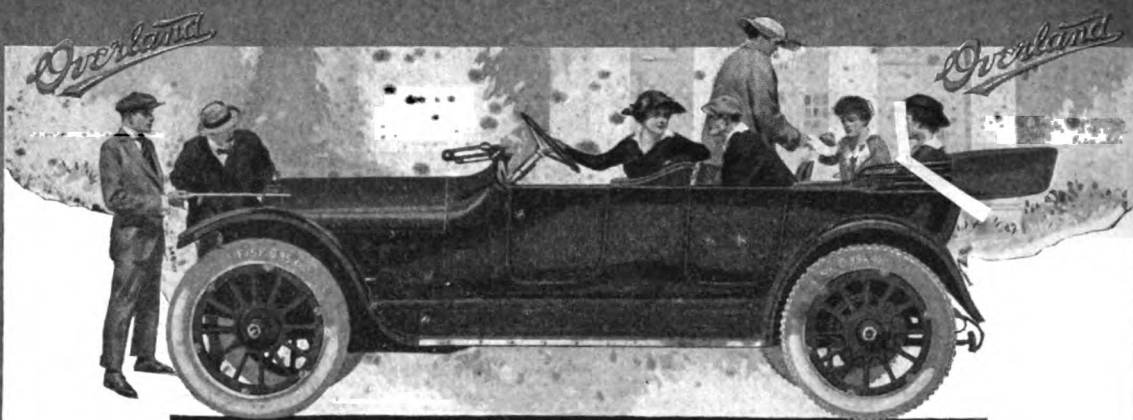
Mobiloils

A grade for each type of motor.

VACUUM OIL COMPANY, Rochester, N. Y., U. S. A.

Specialists in the manufacture of high-grade lubricants for every class of machinery. Obtainable everywhere in the world.

Domestic Branches: Detroit, Ford Bldg. New York, 61 Broadway Philadelphia, 4th & Chestnut Sts
Minneapolis, Plymouth Bldg. Boston, 49 Federal St. Chicago, Fischer Bldg.
Indianapolis, Ind. Pythian Bldg. Pittsburgh, Fulton Bldg.



The 1916 SIX - \$1145

Model 86

f. o. b. Toledo

Increased Production Effects Big Price Reduction

WITH our production capacity increased to 600 cars per day, we are in a position to offer the 1916 Overland Six at the remarkably low price of \$1145. You will, we believe, find that this car is considerably under the market price of other Sixes having equal or similar specifications.

Grasp the full significance of its size as denoted by wheelbase, seating capacity, tires; of its generous, efficient power equipment; of its superior ignition; of its every comfort and convenience; of its beautiful lines. Then realize that the Overland price for these extremes of luxury is only \$1145.

Large, roomy seven-passenger touring car
Improved 45 horsepower six cylinder bloc motor
Exceptionally powerful—unusually economical
35 x 4½-inch tires all around; non-skids on rear
125-inch wheel base; high tension magneto ignition
All electric control buttons on steering column

Specifications

Seven-passenger touring
125-inch wheelbase
45 horsepower motor
High tension magneto
Electrically started
Electrically lighted
Full stream-line body design
Genuine leather upholstery
One man top

Pockets in all doors
Rain-vision, ventilating type
windshield built in

Extra long underslung rear
springs
Full floating rear axle
35 inch x 4½ inch tires; smooth
tread in front; non-skid in rear
Left hand drive
Center control
Demountable rims
One extra rim
High grade magnetic speed-
ometer
Electric horn
Electric control buttons on steering column

"Made
in
U. S. A."



The new Overland Sixes are being demonstrated and delivered now. See the Overland dealer in your town.

Catalogue on request. Please address Dept. 428.

The Willys-Overland Co., Toledo, Ohio

Also Manufacturers of Willys-Knight Automobiles

VOL. XL.

NO. 4.

AUTOMOBILE JOURNAL

\$1.50 the year
10 cents the copy

PAWTUCKET R.I.

Sept. 25, 1915

"LIFE INSURANCE" TOOLS

Just a little care in "tightening up" now and then insures the safety of those who ride in the car. If this constant adjusting is a mean, difficult task human nature neglects it, but with Mossberg No. 14 Set, it is such a clean, clever job that you like to take care of your car.

Not only
Guaranteed
to stand the
work—but
Guaranteed
to please you.

If you will
say
"Mossberg"
when you
order
Wrenches and
Tools you will
save money
and worry



Mossberg Socket Set No. 14.

If your dealer won't
remittance and we

\$12.00

serve you send
will deliver.

FRANK MOSSBERG CO., Attleboro, Mass.

And the
Premium is
low—isn't it?

\$12.00

for
lifetime
work.

A Complete
**MOSSBERG
TOOL
BOOK**
No. 171 E
will be sent
free

TEXACO MOTOR OIL

In Compression There is Power

FOR steady, silent power from the motor of your boat, car or plane you need a lubricant that gives a perfect piston seal.

There is no leakage from the combustion chamber when you use Texaco Motor Oil. It eliminates this source of waste. It enables your motor to deliver its maximum power. It utilizes the whole force of each fuel charge.

Texaco Motor Oil burns absolutely clean — leaves no hard carbon deposits. It flows freely in the coldest weather — will not congeal or grow lumpy.

Good garages everywhere can supply you with Texaco Motor Oil in 1 and 5 gallon cans.

Motor Miles, a booklet worth reading, is yours for the asking. Write for a copy today.

THE TEXAS COMPANY
New York City



VOL. XL.

NO. 5.

AUTOMOBILE JOURNAL

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PAWTUCKET R.I.

Oct. 10, 1915

Oil Wear

How often do you stop for oil ?

DO you watch to see whether your oil "wears" well or poorly?

You should.

You may be sure of this: An oil that "wears" poorly, lubricates poorly.

For the next 500 miles note down the quantity of oil you use.

Then clean out your motor. For the following 500 miles use the grade of Gargoyle Mobiloils specified for your car in our complete Chart of Automobile Recommendations.

Again note the quantity consumed.

The result will demonstrate the superior "wear" of the correct grade of Gargoyle Mobil-

oils. To many motorists the difference is astonishing.

What accounts for it?

It is due partly to the oil's *lubricating efficiency*—which remains unimpaired under the heat of service—and partly to the correctness of the oil's *body*, which assures an adequate supply to all working parts and a perfect seal between pistons and cylinder walls.

With a perfect piston seal, fuel gases cannot blow past the piston rings, destroying the oil film and wasting power; nor can undue quantities of oil work into the combustion chambers and form troublesome carbon deposits.

The "wear" of the grade of Gargoyle Mobiloils specified for your car will give you striking proof of its lubricating efficiency.

We will gladly mail you the complete Chart on request.



Mobiloils

A grade for each type of motor.

In buying Gargoyle Mobiloils from your dealer, it is safest to purchase in original packages. Look for the red Gargoyle on the container. For information, kindly address any inquiry to our nearest office

Gargoyle Mobiloil "A"
Gargoyle Mobiloil "B"

Gargoyle Mobiloil "E"
Gargoyle Mobiloil "Arctic"

VACUUM OIL COMPANY, Rochester, N. Y., U. S. A.

Specialists in the manufacture of high-grade lubricants for every class of machinery. Obtainable everywhere in the world.

Domestic Branches: Detroit, Ford Bldg. New York, 61 Broadway Philadelphia, 4th & Chestnut Sts.
Minneapolis, Plymouth Bldg. Boston, 49 Federal St. Chicago, Fischer Bldg.
Indianapolis, Ind., Pythian Bldg. Pittsburgh, Fulton Bldg.

ANNUAL ENGINEERING NUMBER



The November Edition of the **MOTOR TRUCK** will be the Annual Engineering Number. This issue will be given over to a series of articles that will deal with subjects of unusual interest to the industry. These will be prepared by men of undoubted capacity, whose presentations will be of extreme value, not only to the industrial interest, their representatives, and those who own and operate motor vehicles, but to all who have to do with highway transportation.

This edition will have features that will be enlightening to those who are studying and investigating the subject of haulage efficiency. These will be of unusual scope and extremely comprehensible.

These special presentations will cover a diversity of subjects, which will in the main relate to utilization of vehicles in unusual operating conditions, to the adaptation of machines for developing business, to the value of body equipment expressly designed for specific service, to development of efficiency, to the economy of systematic operation, to loading and unloading facilities, which will be, as transportation engineering information, as valuable to manufacturing and distributing interests as to the owner.

Highway haulage efficiency is only obtainable with operating units that will insure maximum freightage at minimum cost, and this phase will receive special attention.

The edition will largely exceed the usual distribution and will reach a very large number whose attention will be directed to specific features. It will reach business men—who buy solely for economic reasons.

The advertising value of this number will be remarkable, for it will have qualities that will impel its preservation in every engineering library, aside from careful reading directly following its publication.

THE MOTOR TRUCK

Times Building

Pawtucket, R. I.

VOL. XL.

NO. 6.

AUTOMOBILE JOURNAL

\$1.50 the year
10 cents the copy

PAWTUCKET R.I.

Oct. 25, 1915

Save Money!

IF you find it necessary to have your motor overhauled every 2,000 miles, the carbon removed from the cylinders and the valves ground, the trouble is pretty sure to be the lubricant you use. (*an expensive proposition*)

Escape this trouble, annoyance, worry and expense by using the right oil. It is, in the end, the cheapest you can buy.

Eagleine No Karbon Auto Oils will solve your problems—add power to to the motor, stop undue wear, and *will not carbonize*.

Eagleine economy and satisfactory service are known wherever there are motor cars—we have

records of cars driven *20,000 miles* in ordinary service without carbon trouble. This is very *unusual proof* that Eagleine is the perfect lubricant.

There is a special grade of Eagleine oil for every type and make of car. The cost is no greater than for other makes. Good dealers everywhere sell it in sealed containers.



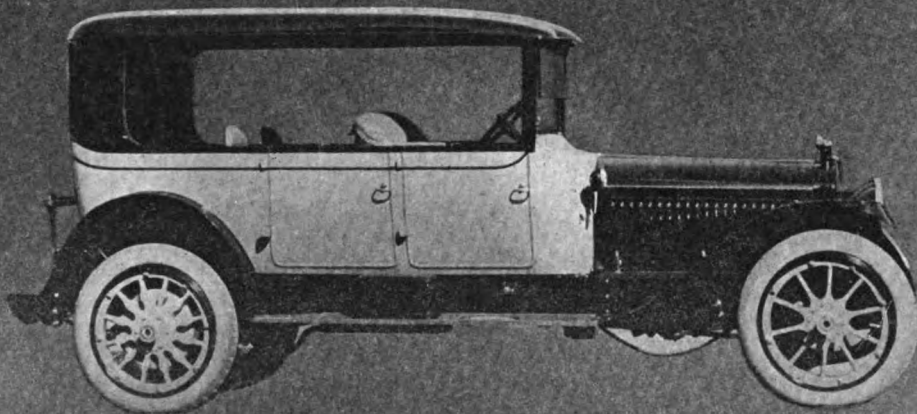
As evidence that Eagleine No Karbon Oils will eliminate overheating and carbon trouble we should like to send you our book of letters which tells the experience of a legion of car owners with Eagleine in all parts of the country.

Send for booklet today.

EAGLE OIL AND SUPPLY COMPANY

104 Broad Street, - - - BOSTON, MASS.

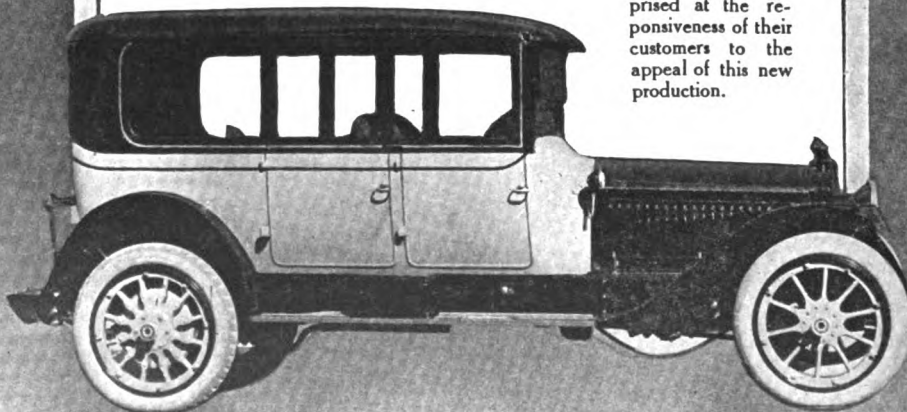
SPRINGFIELD CONVERTIBLE BODIES



THE limousine and the touring car are completely satisfactory only in certain seasons. The new Springfield Demi-Convertible body has no such limitations; it is the all-year, all purpose body.

More and more in America, as in Europe, the tendency is to demand protection from the sun, the dust and sudden showers even in touring. This body with its permanent top provides such protection, while it gives plenty of air and an unobstructed view. It may be converted into a limousine.

Dealers will be surprised at the responsiveness of their customers to the appeal of this new production.



SPRINGFIELD METAL BODY CO.

SPRINGFIELD, MASS.

VOL. XL.

NO. 9.

AUTOMOBILE *JOURNAL*

\$1.50 the year
10 cents the copy

PAWTUCKET R.I.

Dec. 10, 1915

Show Issues Automobile Journal

NEW YORK

Held December 31 to January 8

ADVANCE NUMBER

December 25 issue

REVIEW

January 10 issue

CHICAGO

Held January 22 to January 29

ADVANCE NUMBER

January 20 Issue

REVIEW

February 10 issue

BOSTON

Held March 4 to March 11

Display of Pleasure and Commercial Cars

ADVANCE NUMBER

February 28 Issue

REVIEW

March 10 Issue

Great Shows—Great Editions

Make Your Space Reservations

AUTOMOBILE JOURNAL

TIMES BUILDING

PAWTUCKET, R. I.

Overland

Overland

Model 75 - F.o.b. Toledo

\$615

Roadster \$595

"Made
in
U. S. A."



Electrically Lighted and Started

Four inch Tires

Here is another Overland model. A brand new car at a brand new price. Many people prefer a car that is smaller, lighter and more economical to run, but with the advantages of the larger and higher priced cars.

Model 75 is a comfortable, family car, with virtually all the advantages of the very large cars at a price which is well within reach of all automobile buyers.

The price is only \$615!

It has a powerful motor; electric starting and lighting system; high tension magneto ignition; 104-inch wheelbase; cantilever springs; four-inch tires; demountable rims; streamline body design.

This season our factory capacity has been increased to 600 cars a day.

This explains our ability to give so much for so little money.

This newest Overland is a beauty.

The body is the latest full streamline design with a one-piece cowl.

It is handsomely finished in solid black with bright nickel and polished aluminum fittings.

Five adults can ride comfortably. While the car is roomy, it is light in weight, 2160 pounds. The tires are four-inch all around.

The motor is four cylinder, long stroke bloc type, having a 3 1/4-inch bore and 5-inch stroke, horsepower is 20-25.

This car is very easy to handle. It responds quickly.

The electric switches are conveniently located on the steering column.

It has the easy working Overland clutch which any woman can operate.

The brakes are large and powerful.

The rear springs are the famous cantilever type. These are probably the easiest riding springs ever designed, insuring absolute comfort.

The seats are roomy and comfortable for the soft cushions are built over deep coiled springs.

In short, there is everything that makes this car up-to-date and comparable with many cars costing considerably more money.

You will be delighted when you see it, and ride in it.

Specifications of Model 75

Pure streamline body five-passenger touring car

Finished in black with nickel and polished aluminum fittings

Wheelbase 104 inches

High-tension magneto ignition

20-25 Horsepower motor; cylinders cast embossed

Electric starting and lighting

Headlight dimmers

Electric switches on steering column

31 x 4 inch tires

Non-skids on rear

Left hand drive; center control

Floating type rear axle

Cantilever springs on rear

One-man top

Built-in, rain-vision, ventilating type windshield

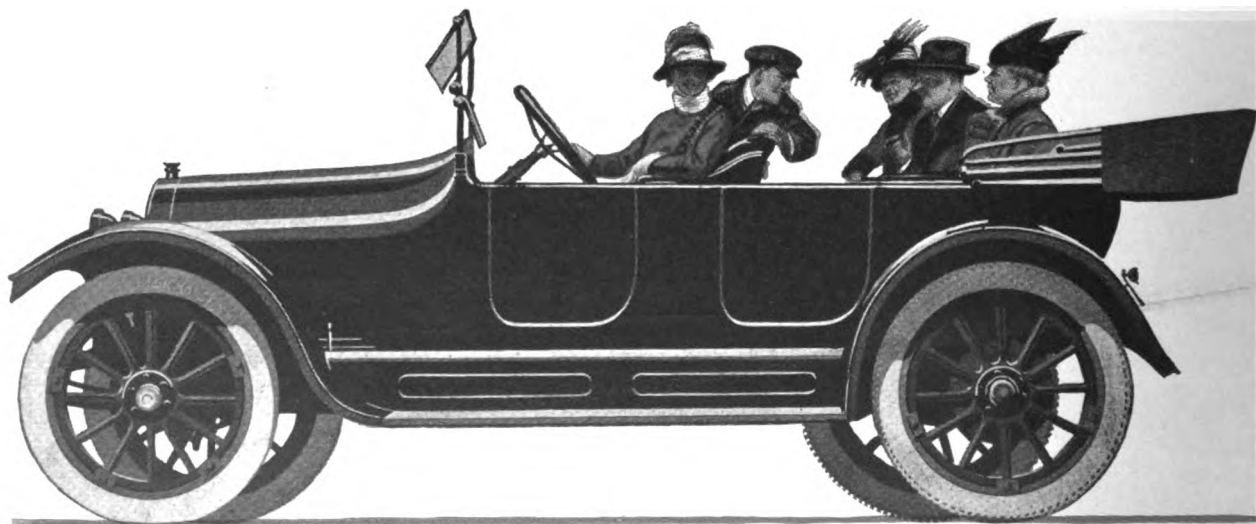
Magnetic speedometer

Electric horn

Full set of tools

Catalog on request. Please address Department 600

The Willys-Overland Company, Toledo, Ohio



VOL. XL.

NO. 10.

AUTOMOBILE JOURNAL

\$1.50 the year
10 cents the copy

PAWTUCKET R.I.

Dec. 25, 1915

Abbott-Detroit

This New Six is the Greatest Selling Proposition in the 1916 Field

THINK of it—an Abbott-Detroit Six—designed and built—as every other Abbott-Detroit model has been—by Morgan J. Hammers—

And selling at \$1195.

It is Mr. Hammers' supreme achievement as an automobile engineer---a car that is going to add prestige to the already enviable reputation of the Abbott-Detroit.

The recently reorganized Abbott-Detroit Company is composed of men of large experience and ample capital---men who are accustomed to doing big things in a big way and who have the ability and the means to accomplish what they undertake.

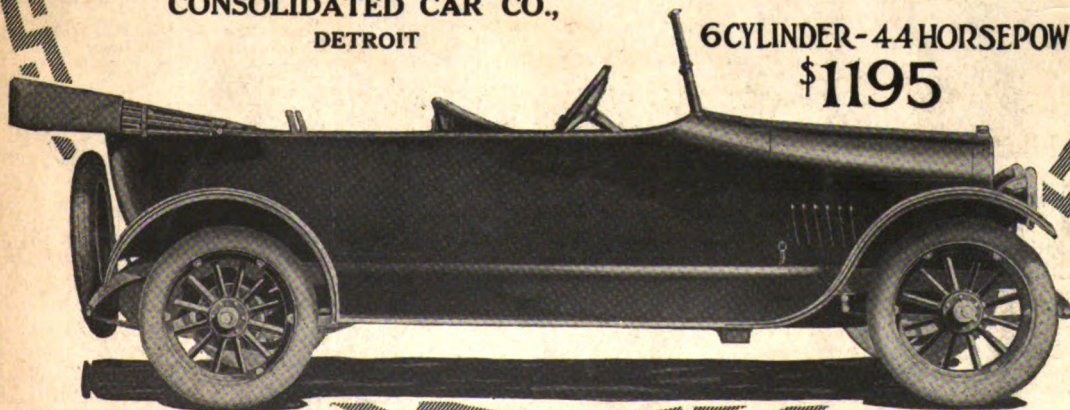
Plans for the biggest year in Abbott-Detroit history have all been perfected.

You will see the new car in four body designs at the New York and Chicago Shows.

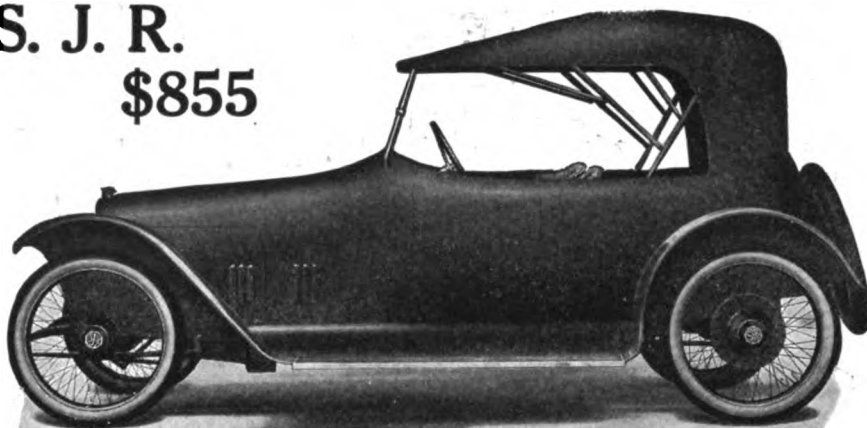
**But don't wait. If you want to share in the opportunity
that this new Six presents write at once for territory.**

**CONSOLIDATED CAR CO.,
DETROIT**

**6 CYLINDER-44 HORSEPOWER
\$1195**



S. J. R.
\$855



Dealers: Look Into This Car!

Here is a car that will draw from every class of buyers in your territory. The owners of big cars will need it as an auxiliary. The family of moderate means will find it a social help. The salesman, the doctor, all who must cover territory, in their business, will find it not only an economical means of transportation but an effective maintainer of prestige.

Its sleek, snappy body lines, with the dull-gray finish, suggest a high priced European design.

The ratio of horsepower to car weight is very high, insuring a responsiveness and quick pickup seldom found in any car regardless of size or price.

SPECIFICATIONS :

Motor. 25-30 h. p., 3 1/4 in. bore by 5 in stroke, 4-cylinder cast enbloc with removable water cooled head. Two bearing crank shaft of liberal proportions made of heat treated chrome-nickel steel.

Transmission. Selective sliding gear type, three speeds forward and one reverse. Gears, high carbon steel triple heat treated. Transmission case bolts to rear side of clutch bell on motor case, forming a unit power plant, which is supported at three points.

Clutch. Disc type of special design

Lubrication. By plunger pump driven by the cam shaft and accessibly located on the side of the motor. All moving parts are constantly covered with a spray of oil.

Ignition. By high tension, water-proof, oil-proof and dust-proof magneto.

Starting and Lighting. Six volt, 80 ampere single unit system with storage battery.

Carburetor. Is a special design developed especially for this motor, designed to secure great pulling power at low speeds, quick pick up and extreme fuel efficiency at high speeds.

Cooling. Is by the tested and proven thermo-siphon system with unusually large radiator capacity.

Gasoline Supply. Is by gravity feed from 13 gal. tank carried in cowl.

Control. The car is driven from the left side, with control levers in the center mounted directly on transmission case. Gear shift lever has positive locks for each of the four gear positions. Spark and throttle levers are mounted directly on the steering wheel.

Instrument Board. Of highly finished natural wood, all instruments being mounted flush. Directly under the driver's eye are the Standard 60-mile speedometer with total and trip mileage dials driven from transmission. Oil gauge, magneto and light switches, two ammeters, gasoline filler cap and gasoline indicator.

Wheelbase, 108 in. Tread, 55 in.

Rear Axle is of the full floating type with low carbon case and hardened steel differential gears, pinion and bevel ring. Ball bearings are used throughout.

Springs. Rear, 48-in. cantilever type so slung as to minimize all road shocks. Front, 42 in. long, of chrome vanadium steel.

Steering Gear is irreversible, of the worm and sector type, and operated by a

17 in. wheel so positioned as to afford maximum comfort for the driver.

Frame. An original design in high carbon steel of a type found only in high-priced cars.

Wheels. Hook wire wheels with standard QD rims. Extra wheel and tire supplied with car.

Tires. 30 by 3 1/2 in. all around. Plain tread front and non-skid rear.

Body. 3-passenger roadster type of pressed steel, finished with a special dull surface, and luxuriously upholstered in process leather. Seats stuffed with natural curled hair.

Fenders. An attractive design in pressed steel. They are joined by aluminum covered aluminum bound running boards.

Windshield. Clear vision—rain vision—ventilating type—a single piece of French bevel plate glass.

Top. One man type with dust envelope.

Lamps. Electric. Two headlights with dimmers; tail light and dash light.

Equipment. Vibrating horn, tool kit and tire repair outfit. Wheel carrier with extra wheel and tire.

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PAWTUCKET R.I.

Jan. 10, 1916

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January 20 Issue

REVIEW

February 10 Issue

BOSTON

Held March 4 to March 11

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ADVANCE NUMBER

February 28 Issue

REVIEW

March 10 Issue

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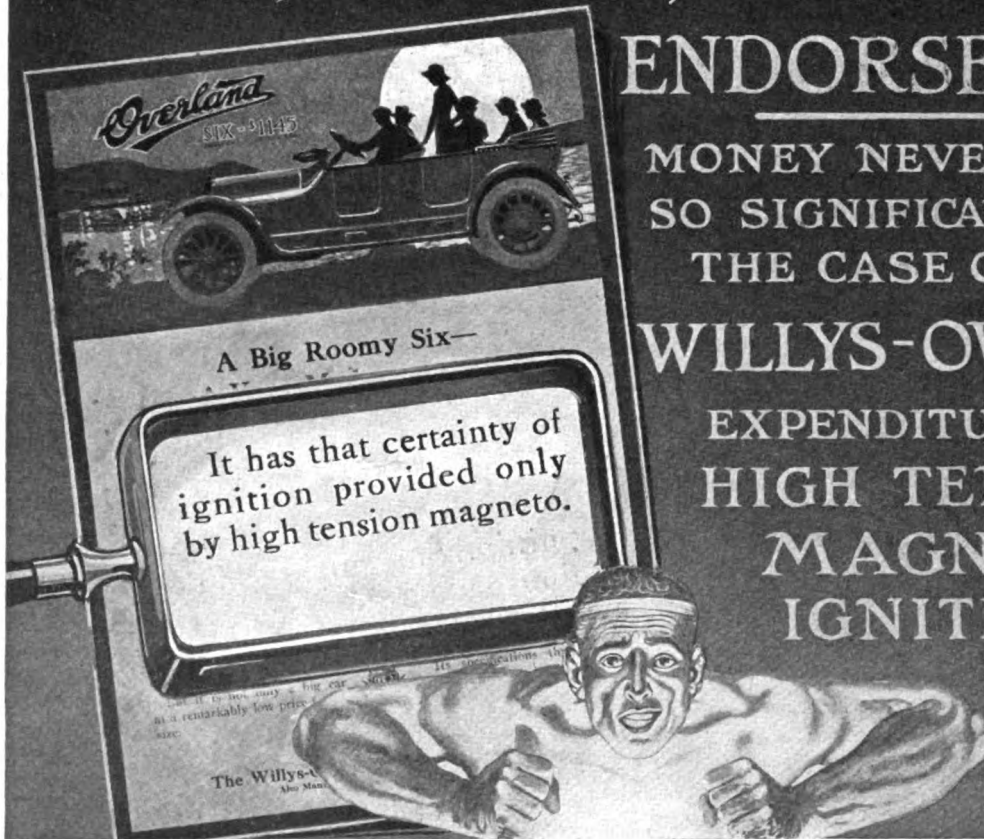
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Display Held March 4 to March 11.

BOTH PLEASURE AND COMMERCIAL CARS.

This show marks the beginning of the active buying season in these sections—The greatest motor vehicle and accessory market in America.

A show for dealers and car owners, and this year it will include as well the most representative display of commercial vehicles ever made in America—The only national showing of business wagons this year.

The Boston show is the business show of the year, and the Journal covers the entire field from which it will draw.

SPECIAL NOTICE: Starting with the February 28 Advance Show Number of the Automobile Journal, the size of page of this magazine will become standard. The type page 7 $\frac{1}{4}$ by 10 inches; The full page 9 by 12 inches.

Make your space reservation today. Last form closes February 20.

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SPLITDORF APELCO

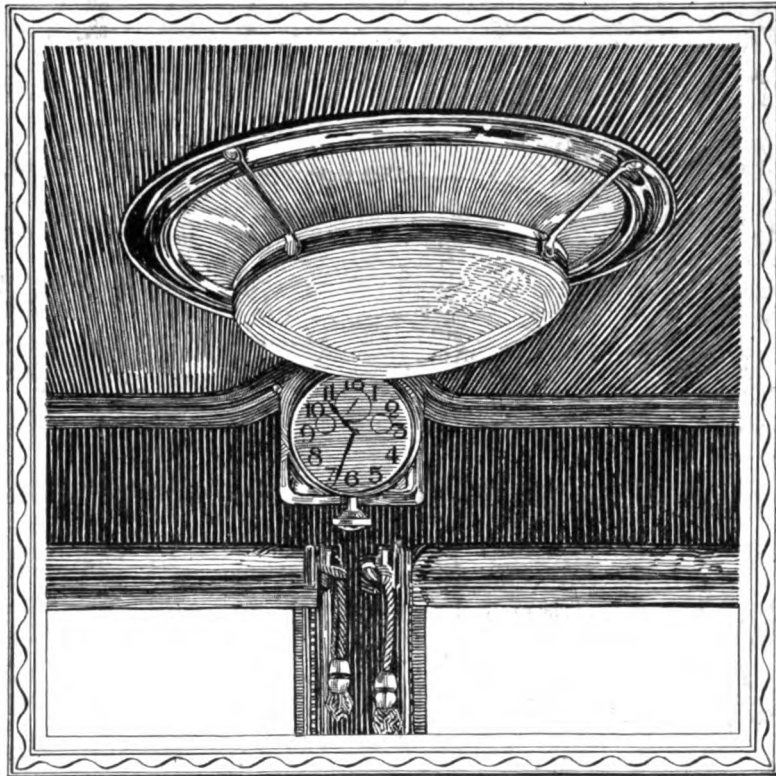
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